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The Outlook

The End of the "Bismarck"

ONCE more the aircraft torpedoes of the Fleet Air Arm have proved their worth, for if the T.S.R. machines of H.M.S. *Ark Royal* and *Victorious* had not slowed down the speed of the German battleship *Bismarck* her end might not have come as soon as it did. In the inter-war years there were varying opinions about the value of that weapon, the Fleet Air Arm always professing a strong belief in it, while the shore-based R.A.F. seemed distinctly dubious.

There are several points of air interest about the great sea fight which ended the brief career of Germany's latest and greatest capital ship. It is very satisfactory to know that the Royal Navy has another carrier, H.M.S. *Victorious*, in commission, and it is also gratifying that the adventurous history of H.M.S. *Ark Royal* now includes another success. Thankfulness must be felt for the long air endurance of the Catalina flying boat (why has this splendid aircraft been named after a contemptible Roman conspirator?), for that played an important part in keeping the British Admirals on the track of the fleeing enemy. A Sunderland also shared in this good work; that fine flying boat is still far from obsolescent.

The strength and accuracy of the A.A. fire from the *Bismarck* is rather surprising. A brief appearance meant holes in the scout's hull. Of course, flying boats make easier marks than torpedo-aircraft, and it was the Catalinas which came in for these attentions. The T.S.R. machines which launched the torpedoes do not seem to have suffered from the ship's fire. It is also rather surprising that a battleship fleeing for her life should have been able to send up aircraft to attack the British air scouts. Those German machines must have been catapult seaplanes and the battleship would have to slow down to hoist them on board after they had alighted beside her. The loss of time would have been worth while if it had meant destroying the following scouts but, even so, the captain of a partially crippled ship must have grudged the time and, as it proved, the time was wasted.

Atlantic Deliveries—

LAST week, in his article on Atlantic deliveries of American aircraft, Mr. Tennant dealt with the technical aspect only. There is, however, another which will have to be solved simultaneously, unless by the time deliveries begin to assume really huge proportions America has come into the war "officially." We refer to the problem of getting the crews back to the other side.

Even with the present scale of deliveries, much time is wasted by sending the crews back in surface vessels, or by the too-infrequent civil aircraft trips. It is obviously no manner of use having a tremendous flow of American aircraft capable of being flown to this country if a bottle neck is formed on the other side by delays in getting the crews across to collect new deliveries.

At the present time the Atlantic ferry service, known as Atfero, is controlled by chiefs of the Canadian Pacific Railway, who cannot as yet be expected to have a detailed knowledge of the many problems involved in running a trans-ocean air service. It is, of course, true that British Overseas Airways have lent a certain number of its captains to assist in the running, but B.O.A. officials with long experience have left the organisation. It is only necessary to mention two: Col. Burchall has joined the British Purchasing Commission, and Mr. Woods

Humphery, who was general manager of Atfero, has resigned that post.

It is no secret that neither the Air Ministry nor the Ministry of Aircraft Production has so far shown any appreciation of the value of commercial aviation in wartime. One may expect the new Minister for Aircraft Production, Col. Moore-Brabazon, to show at least a friendly disposition, and certainly a full understanding of the vital importance of civil aviation. But the department is not under his care, and there appears to be little likelihood of impressing officers of the Air Ministry, harassed as they are by their immediate and desperately urgent military problems.

It may be that the urgency of ensuring the frequency and regularity of deliveries of American military aircraft will serve to bring about a realisation of the very close connection between civil and military aviation, in this particular sphere at least.

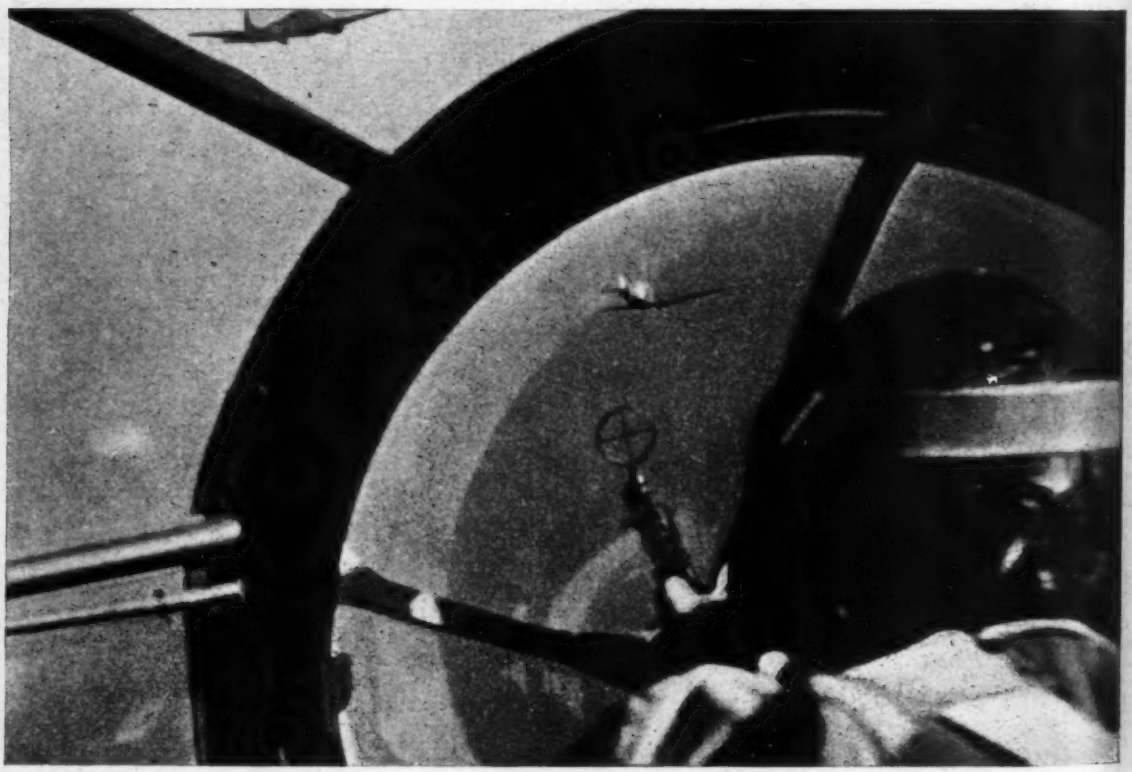
—and Atlantic Air Services

ALREADY the existing Atlantic commercial air services have proved totally inadequate. As time goes on they will become ever more so, and we might as well face the fact in time. The number of people to whom time is all-important is considerable now, and will grow rapidly as our association with the United States increases in volume and closeness. At the very least there should be a daily service, and the time will probably come when a service every 12 hours will be ensured of a full load on every trip.

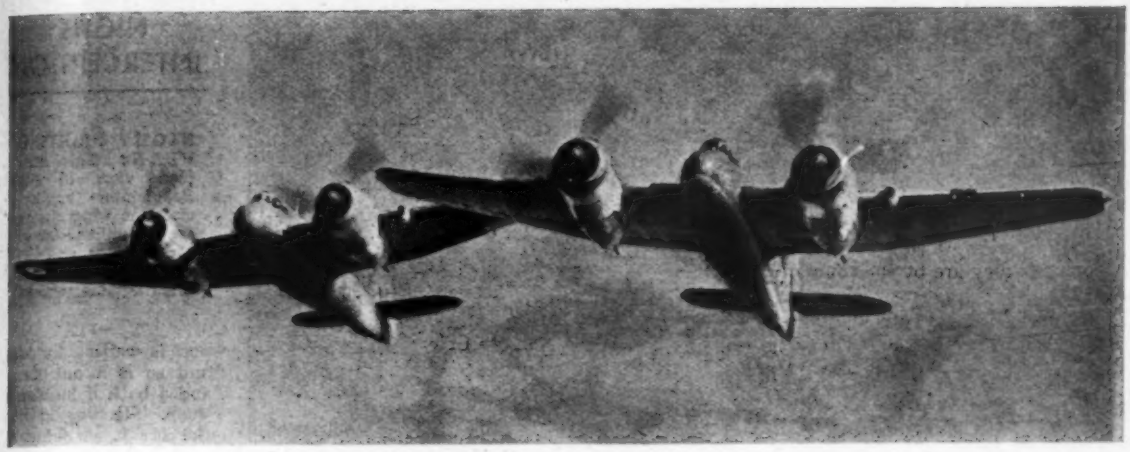
While a frequent service across the North Altantic could be justified on military grounds alone, there are also many commercial reasons for establishing it. Prestige counts for a good deal, and this is, perhaps, even more true of the Latin American countries than of the United States. At the present time the only service across the South Atlantic is that operated by L.A.T.I. Recently it was announced that Air France is to resume its service to South America, presumably from Dakar. That is virtually giving Germany an opportunity which Great Britain cannot view with indifference, and which even the United States, after Mr. Roosevelt's speech, must regard as something of a threat.

The provision of the flying equipment and personnel could hardly be undertaken by Great Britain alone, but American interests are so closely involved that the United States could hardly do other than lend a friendly ear to any suggestion for close co-operation. Hitherto Pan American Airways have had a monopoly on extra-U.S.A. air services. It would seem that the time has come when that position might be reconsidered. Purely commercial considerations went by the board long ago, and commercial aviation across the Atlantic is now one of the "tools" for which Mr. Churchill pleaded.

It is not, of course, for us in Great Britain to "lay down the law" in what our good friends on the other side may well regard as purely family affairs, but the great national interests of the two countries are now so nearly identical that we may, perhaps, be forgiven for making the suggestion that in the matter of transatlantic commercial services our friends should come to our aid as they have done so splendidly in connection with armaments.



ACHTUNG SCHPITFEUER: A Spitfire of the Fighter Command diving through a formation of Heinkel 111s. This photograph, taken from one of the Heinkels, shows that the *Luftwaffe* are still using the old fashioned ring and bead sight for their free guns.



TWO OF OUR LATEST: Beaufighter interceptors in formation.

NIGHT INTERCEPTION

Photographs of Beaufighter : Night-fighter Station Visited

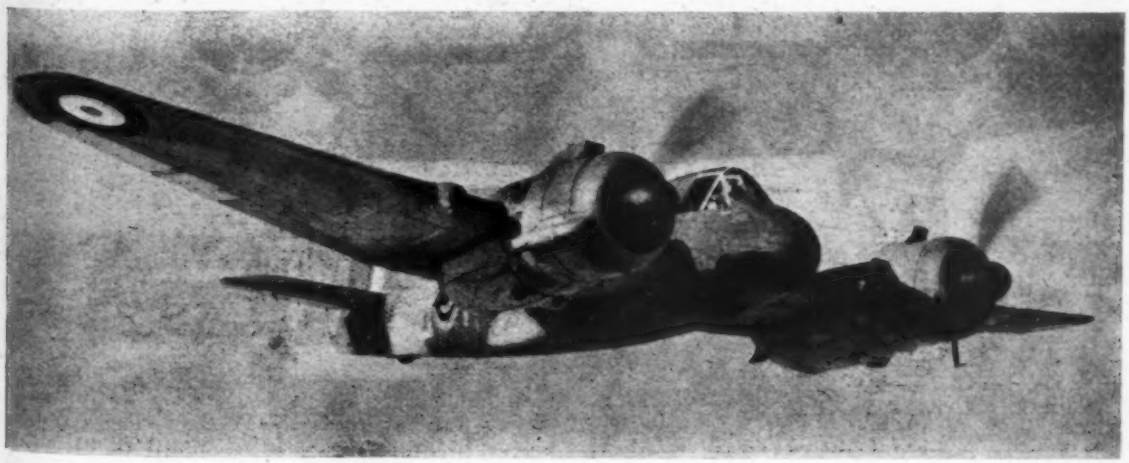
THE Bristol Beaufighter, which hitherto has only been a name to many people, has played a prominent part in the recent night fighting successes. We are now allowed to publish these first photographs of the type but no other details, such as engine type and horsepower, speed or armament, may be mentioned. Their publication coincides with a visit by us to a night-fighter station to see something of the back-stage scenes in this tussle against the night bomber.

Wherever and whenever night fighting is referred to, secrecy regulations make it appear that much that really matters must be left unsaid. There is, however, a great deal more than the secret devices which contribute to success in making night interceptions.

The difficulty of interception is exemplified in the chase of the *Bismarck* where only the sea's surface had to be searched and yet a large number of warships were used to find, maintain contact, and finally kill. How much more difficult, then, is the night fighter's job to search out and shoot down a machine which may be anywhere over Great Britain, the North Sea, the English Channel, the Lowlands or Occupied France, at a height of anything from 3,000ft. to 30,000ft. Suffice it to say that we can, by secret means, tell our fighter where the enemy is and it is then up to him to make the final visual contact.

We have a reputation for being a slow nation. The first Heinkel 111 shot down by this means met its end somewhere over the Eastern Counties in October of last year. During May this year about 100 enemy night raiders were destroyed. The station we visited made no less than 31 interceptions in that fortnight—not so slow, we think!

Night fighting was not at first accepted by our pilots with any enthusiasm. By comparison with the spectacular day fighters and their prodigious successes last autumn, the hours spent in the air at night with but little chance of success held no attraction. That is now all changed and the night fighters consider themselves more or less in the nature of a *corps d'élite*. It is a medical fact that this



NIGHT AND DAY: The Beaufighter is classified as an interceptor for use during any period of the twenty-four hours. In this view the retracted tail wheel is apparent.

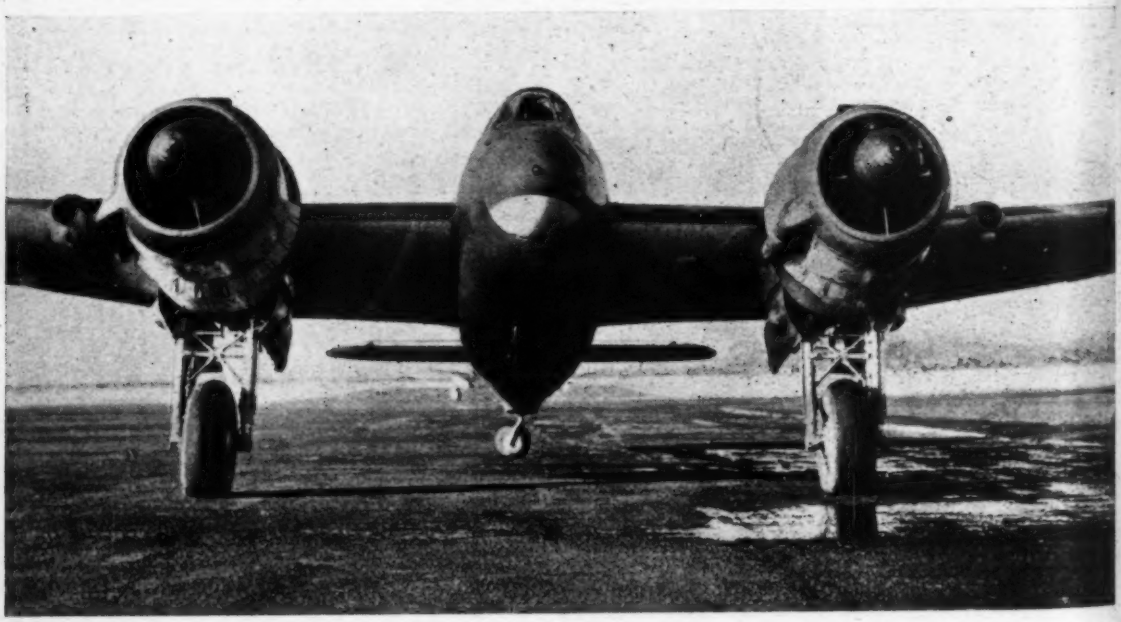
NIGHT INTERCEPTION

NIGHT FIGHTING PLAN: This near plan view of the Beaufighter emphasises the wing shape, the streamline form of the fuselage and the completely - retracted main landing wheels.

spiritual elevation of a man's work renders him better fitted for the job in hand. Certainly we have never met greater enthusiasm than was displayed at this station. Everyone thinks, talks, argues and positively oozes night fighting. To further this policy the authorities have, so far as is possible, tried to remove the petty annoyances of service life. When a man comes down from a long flight he is not expected to walk two miles to the mess. Transport is waiting for him and so is a hot meal and a bath if he wants them. Sleeping on into the day is encouraged, diets are carefully checked, and as much leave as possible is granted.

The Commanding Officer of the station is very confident. Incidentally, he is a Group Captain with the D.S.O. and two bars. He was shot down over St. Omer in the Battle of France last year and has tasted the joys of a prisoners of war camp. The Germans will be sorry they let him escape.

Bristol Beaufighters, Hawker Hurricanes and Boulton Paul Defiants, all take their specialised share of the nightly operations. Patrols or individual machines may start an interception over, say, Birmingham, and yet do the actual killing over the Continent. Long range is a necessity. A quick manœuvre on the part of the quarry means a further



CLOSE UP: Seen from the front with the tail down, this photograph of the Beaufighter shows the excellent view enjoyed by the pilot over the pointed nose. The apertures outboard from the engines are for oil cooling, not armament.

patient search to establish contact once more. It is therefore essential that the first burst of fire shall be the killing burst.

Day fighting Spitfires, also, perform on moonlight nights when "cat's-eyes" can work unaided. The vapour trial is one of the most useful guides to visual interception of high raiders.

It is a tribute to the efficiency of our system to note that German bombers operating over this country at night now have their markings almost obliterated. Undoubtedly they are difficult to see and that is why the pilots on duty wear dark "adaptation glasses" while they wait in the pilots' room, for it takes no less than 45 minutes for the eyes to reach maximum efficiency of night vision. It is for this reason that the searchlights are not frightfully popular with the pilots. They—the searchlights—are also efficient and it is no joke to find oneself in a sudden glare just when a dim and shadowy enemy is perceived.

Another phase of night-fighting which is very successful is the employment of Douglas Havocs (D.B. 7s or Bostons modified for night fighting) over enemy aerodromes on the Continent. Here they fly around waiting for German bombers to take off or land. Usually the attacks are made at such a height that parachutes cannot be used, and the German crews are eliminated just as certainly as if they were shot down over this country. The Havoc has quite an exceptional performance and is popular with the pilots, who take them on midnight jaunts.

NIGHT INTERCEPTION

DOUGLAS, FORD AND CONSOLIDATED

Huge Plants for Line Assembly of Liberators

CONSOLIDATED four-engined Liberators will be built at two new plants to be erected in the United States at Fort Worth, Texas, and Tulsa, Oklahoma. The arrangement under which the factories will be built and operated is reminiscent of the "shadow factory" scheme in this country, but there are important differences. The Corps of Engineers, U.S. Army, has retained the Consolidated Company as design consultants for the layout, and when completed the company will operate the Fort Worth plant. The Douglas Company will operate the other, of an identical design except in so far as ground topography dictates otherwise. The number of operatives to be employed will be about 10,000. Both plants will be supplied with parts and sub-assemblies from a new factory to be erected by the Ford Motor Company at Ypsilanti, Michigan.

Military strategy has probably dictated the location of the two assembly factories in the south-west, as this keeps them away from California and the eastern States, the only two areas of aircraft manufacture in the United States. The factories will be windowless, for black-out reasons, and therefore, as well as for the hot southern climate, will be air-conditioned.

The Moving Line

Each plant consists of three buildings. The largest of these is the main assembly plant, a building 4,000ft. long and 320ft. wide. This will contain a continuous assembly line operated on the principle used for many years in the motor car industry, whereby the line has an intermittently timed movement, each aeroplane progressing from station to station at regular intervals until the completely assembled machine is discharged at the end of the building. The assembly line will start with as many as three rows in line, finishing with a single line of bombers having outer wings in place. The line will be operated on one side of the building in the main assembly bay, which is 200ft. wide and runs the entire length of the building. The feeder bay, which is adjacent to the main assembly bay, is 120ft. wide. It contains a double railroad siding with cross-over tracks permitting the carloads of parts and component assemblies from Ford to be delivered at the point in the line where they are to be used. Alongside the railroad siding in this 120ft. bay and next to the assembly line is a large working space where the parts and sub-assemblies received will be unloaded and made up into assemblies such as tail units, undercarriages, and wings with flaps and ailerons in place. From this location they will be forwarded directly into the final assembly line. The clear height of 40ft. inside the building, the wide assembly bay of 200ft., and the various dimensions of the feeder bays will permit the construction not only of the B-24 type of heavy bombers, but also much larger ones of as much as 195ft. span, weighing up to 200,000lb. each.

The craft will progress in the line from crew to crew. Each crew will be specialised in its particular work, and will be continuously supplied with all the necessary parts, materials and component assemblies at each station with the work so timed as to produce Liberators at the rate of 50 per month. The line will be moved by mechanical means, and will be operated at longer timed intervals between movements when the plant first starts operating. As the work speeds up, so will the line be speeded up to meet the increased efficiency of the operators.

Mr. C. A. Van Dusen, Consolidated vice-president and co-ordinator of plants, has stated that his company is particularly pleased with the arrangement between the three companies whereby Consolidated will be required to furnish all designs for the aeroplane itself and will co-operate with Ford and Douglas. He stated that his company expected to contribute the specialised knowledge of the manufacture of this bomber and to co-operate with Ford with his great experience of line production methods.

Plastic Progress

THE use of wood strengthened by plastic processes for production of major components and stressed parts of aircraft is the aim of the British Plywood Manufacturers, Ltd., who, with this ultimate object in view, have appointed Mr. E. P. King, B.Sc., F.R.Ae.S., to the board as director in charge of their new Aircraft Plastics Division.

Mr. King is well known for the research which he has conducted in the development of plastic materials and their practical application to aircraft construction and has taken an important part in the development of De Havilland aircraft over a long period of years. In the last few years his most important contribution to aeronautical development has been in the sphere of plastics where the moulded hollow wood blade is among his achievements. He is one of the earliest pioneers of plastics for aircraft, and the value of his work is emphasised by the degree of interest which it has aroused not only in Great Britain but throughout the world.

In addition to his unrivalled knowledge of plastics, Mr. King also has considerable experience as an aircraft designer, which provides an ideal combination for the particular work he is now undertaking.

HERE AND THERE

PER BOMBER: Mr. Ralph Bell, Director of Canadian Aircraft Production, hands a cheque for £20,000 to Sir George Wilkinson for the Lord Mayor's Fund. The contribution was from the Queen's Canadian Fund and Mr. Bell brought it over in a new bomber.

Expensive Speed!

CORRESPONDENCE from this country to the Far East can now be sent all the way by air, but the postal rate of 5s. per ½oz. for letters and 2s. 6d. for a postcard is not likely to encourage a rush of patronage. Such air-mail, incidentally, goes via the United States as an alternative to the normal route which is by sea as far as South Africa.

An all-air mail service was already in operation at these rates via U.S.A. to Hong-Kong and Macao, and also to Australia, New Zealand and the Philippines at the slightly lower rate of 4s. 6d. per ½oz. and 2s. 3d. for postcards. The extended facilities now bring in Burma, Ceylon, India, Malaya, Siam (or Thailand) and the Dutch East Indies.

U.S. Negro Fighter Squadron

A NEGRO squadron, the 99th Pursuit, will be formed in the U.S. Army Air Corps. Thirty-three pilots and 276 ground personnel will be trained at Chanute Field, Illinois, by white officers, but later it is hoped that negro instructors will be available from the trained fliers to continue the work.

Safety Regulations

NEW regulations designed to increase the safety of passenger-carrying airliners in Australia have been introduced by the Civil Aviation Department. A first or second class navigator must be carried on every daytime flight of 100 miles or longer and on every night flight of more than 15 miles. On the Australian sections of International air routes, a first-class navigator must be aboard the aeroplane for all flights longer than 620 miles over the sea or over land sections without radio beam aids.

New Scots Air Training Centres

AIR training centres for Scottish youth are to be established in the eastern and western areas. It is expected that each centre will have accommodation for 1,000 recruits for the Air Training Corps. The Lord Provost of Glasgow wants a suitable site and accommodation for 1,000 cadets in the West of Scotland and says that the opportunity should be exploited by a coast or other holiday town which wants a steady income from air training. Scotland needs at least two air training centres to obviate the necessity of lads going south to be trained.

New Zealand Fighter Squadron

COMPOSED almost exclusively of New Zealanders, a fighter squadron recently formed in England under the Empire Air Training Scheme will now go into action at an operational station after completing its training.

The pilots of this squadron are all R.N.Z.A.F. men except their squadron commander and two flight commanders who served in the R.A.F. before the war and who are experienced air fighters, one having served with the Burma Squadron, another with a bomber squadron in France, and the third being a Dunkirk "veteran." Other members have seen action with other units.

Central Australia

THE popular impression that the centre of Australia is a vast waterless desert has gained such firm acceptance that it is very difficult to combat it with the real facts. Consequently many readers will be surprised to read that in February of this year there were such terrific downpours in Western Queensland and the Northern Territory that many aerodromes were out of action and the mails were dropped at the towns without landing. One "river," which in normal times is a chain of waterholes, became a sheet of water 60 miles wide. The truth is that Australia is so vast that climate and vegetation vary very much from place to place, and the characteristics of any one district vary according to the rainfall.

SCIENTISTS AND THE WAR

Aeronautical Expert's Views at City and Guilds Engineering Dinner

THAT it would not greatly matter if all scientific work stopped now was the surprising statement made by Sir Henry Tizard, rector of the Engineering Society of the City and Guilds College, University of London, when he proposed the toast of the society at its recent annual dinner.

Sir Henry, who is known throughout the world of aeronautical research, explained that this was because practically all the scientific basis of the work for this war was well established and what was now required was the successful application of it by engineers.

Speaking of the work of scientists and engineers in this war, he emphasised the difference between them. The scientists, he said, were better known to the public, while the engineers were "hidden in industry." "Are there ten engineers in this country," he asked, "of whom the Cabinet must take notice—or pretend to?"

The City and Guilds College is comprised of the faculties of civil, electrical and mechanical engineering, and last, and also least in numbers but not in importance, the faculty of aeronautics under the guiding hands of Professors Leonard Bairstow and F. T. Hill. This year the Society has been fortunate in having as its president another leader of British aviation, Mr. F. Handley Page.

Still Much to Learn

Mr. Handley Page, as "an unknown warrior of the engineering profession," replied to the toast in a witty speech and told his audience that though they must learn the rudiments of engineering at a college, they have still much to learn after they start work. He asked them to remember that there were other sides to engineering than calculation for design, such as the planning, jig and tool, and progress departments. Engineers, said Mr. Handley Page, in attempting to get their ideas accepted, come up against tremendous "sales resistance," and of all the conservative minds which they meet, the military mind is the most conservative. He instanced the resistance to the introduction of the long bow at Crecy, and then spoke of that most modern of weapons, the air force. His final advice to students was to bear in mind the wisdom of Ecclesiastes about time and chance coming to every man and to grasp opportunity when it appeared.

The course in Aeronautics is a very necessary part of the war effort and has been so recognised by the Ministry of Labour and the Joint Recruiting Board, for though post-graduate activities have been drastically restricted everywhere, this course continues. The present academic year is nearly ended, and the next one will commence early in October. Only students who have, in general, an honours degree in engineering, mathematics or physics (of any university) are eligible for entry to the one-year course. As much of the laboratory work is done on wind tunnels, only a small number of students can be accommodated. Should there be a surplus of applications, the places will be filled by selection.

The syllabus includes aerodynamics, aircraft materials and design, structures, aero-engine theory and design, and navigation and instruments and meteorology. There is also a programme of visits to factories and scientific establishments. Any enquiries may be addressed to, and a syllabus obtained from, Prof. F. T. Hill, Department of Aeronautics, City and Guilds College, Imperial College of Science and Technology, South Kensington, London, S.W.7.

HIGH ALTITUDE FLYING

The Human Body in the Stratosphere : Supercharging : Military Aspects : Pressure Suits and Cabins

By BRUCE FOSTER, B.C.E., D.I.C., A.F.R.Ae.S.

MAN climbs ever higher and higher to the sky. Always he has done so, ever since as a dark ape in the primeval forest he climbed to the tree-tops to spy his enemy before his enemy saw him, or on more peaceful days swung swiftly along the highway of branches, far above the twisting and vine-tangled tracks of the earth.

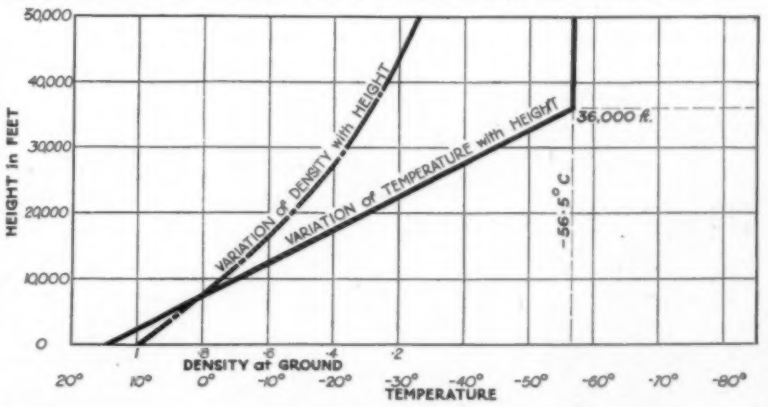
Always he has done so, in the immediate past in the pursuit of more comfortable and regular air transport, but in the urgent present it is for the interceptions of aerial war that he strains towards the stratosphere.

We are now on the threshold of a raising of the combat level of the war in the air, and this summer's days will see fights at altitudes of 30,000 and 35,000ft., perhaps even at 40,000. There will be no spectators at these encounters, for they will be quite invisible from the ground, and only the pilots engaged in them will see the victories and the defeats. The sky trails will slowly form their curves of white, but which is attacker and which defender will be even more difficult to decipher than it was in the battles of 1940.

This article shows the background of scientific and engineering work and high-altitude flight attempts which provide the foundation for the upper air combats of this year. Much of the work of the past has been done for airline flying, notably in the United States, and the Boeing 307 Stratoliner is substantial proof of that country's sound work for what they aptly name "overweather flying." But before going into any detail let us see in general terms why this high-altitude flight is attempted and what is the nature of the difficulties encountered.

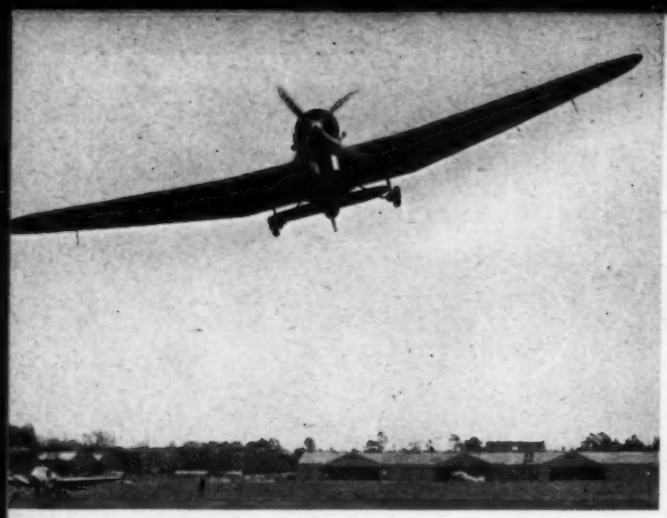
In warfare it is an advantage for bombers to fly high so that they may be above the searchlights and out of the range of anti-aircraft fire, or at least harder to hit, and so that the defending fighters will have to climb higher and so take longer time to intercept them. But of course the greater the height, the less the accuracy of bombing. As for the escorting fighters, they must be above their bombers, ready to dive to the attack on any defending fighters which appear. But they too must be capable of an altitude at least as great as that of the attackers—and so the race goes on, higher and higher.

Up to altitudes of about 30,000ft. the problem for combat aircraft was one more of supercharger design than anything else. But for the higher levels the pilot will be found wanting as well, and mechanical aid must be invoked. He will have to be either in a pressure cabin or suit.



Both temperature and density fall as altitude increases, but above 36,000 ft. the temperature remains constant and this region is known as the stratosphere.

HIGH-ALTITUDE FLIGHT



(Above) The Bristol 138 taking off on its record-breaking flight of June 30th, 1937, when it reached 53,937ft. Note the large air intake. (Right) Extremes meet. Flt. Lt. Adam's high-altitude pressure suit resembles that of a deep-sea diver. (Below) A closer view of the helmeted pilot just before the take-off.

In air transport the pressure cabin has been developed for use at altitudes much lower than 30,000ft. because the passenger cannot be reckoned to be as fit physically as the air force pilot, and in fact should not be taken above 14,000ft. without either oxygen or a pressure cabin. (Long periods even at 12,000ft. can sometimes cause ill effects.) So in achieving high-altitude flight, the first of the three major problems to be surmounted is the human body. The other two are the aero engine and the pressure cabin or pressure suit (which may be regarded as a miniature pressure cabin which the wearer takes with him).

The Atmosphere and the Body

Both the pressure and the density of the air decrease as we go up, and the graph shows how the density has fallen to one-quarter of its sea level value at 40,000ft. It is at 34,000ft. that the pressure has fallen to the same fraction, and it is pressure with which the body is vitally concerned. The proportion of oxygen in the atmosphere is constant and does not lessen as we go up, as is sometimes thought. What does lessen is the pressure available to force the oxygen into the blood stream from the air in the lungs. The pressure of the atmosphere is the sum of the pressures of the gases composing it, and these are nitrogen, carbon dioxide and water vapour, as well as the oxygen.

The late John Tranum, well-known parachute jumper, in a Siebe Gorman test chamber.

As altitude increases, the pressure of each of the constituent gases, as well as the air pressure, decreases, and so the body gets less oxygen. But by increasing the proportion of oxygen in the breath by using an oxygen mask, the pressure of the oxygen constituent of the air is increased and the body receives more nearly the amount to which it is accustomed.

But there is obviously a limit to this process, for there comes an altitude at which the air pressure is so low that not even if pure oxygen is breathed is the body able to absorb enough into the blood stream. This altitude is about 40,000ft., the pressure here being just under one-fifth of that at ground level. At this level a pressure cabin or suit is essential, but it is desirable at altitudes considerably lower.

Anoxæmia

The reason for this is a complaint known as anoxæmia, which is simply "oxygen want." When a pilot does not get enough oxygen he cannot think or act normally, but suffers very much from both physical and mental tiredness. His judgment and memory are poor, and he cannot think quickly or accurately. "What's that little dial say? . . . Six, is it? Six what? . . . Six o'clock, I s'pose. . . . No, can't be that. . . Oh, yes, boost, that's it, of course, boost pressure. . . . Boost is six, six is boost. . . . Why shouldn't it be? Six boosters, six roosters. Oh, who cares about roosters anyway?"

Forgotten is the fact that the dial is there to warn him that he may be using a boost pressure damaging to his engine—and forgotten are many other things, too. Without an adequate supply of oxygen the pilot becomes a victim of "pilot error," and may do quite unaccountable things, forgetting the simplest facts and making the silliest mistakes.

Too little oxygen and too much alcohol have effects very closely related, in that the more one is affected the better one feels! But oxygen want is dangerous, and if the brain is completely cut off from its oxygen supply it will die in seven or eight minutes. So will animals exposed to the low pressure of 50,000ft., even if supplied with an atmosphere of pure oxygen.

Another effect of high altitude is loss of weight due to the lowering of boiling point, so facilitating the evaporation

Above is the Boeing 307 Stratoliner "over the weather," while the other view is the cylindrical pressure cabin under construction.

of moisture from the body. And stomach gases expand, their volume being quadrupled at 34,000ft. This causes hearty eructation and also other effects even more unpleasant though sometimes less audible. Another effect, dangerous if allowed to become too great, is the increase of pressure of the spinal fluid on the brain. For all these reasons, man must be "supercharged" if he is to function at high altitude.

Temperature is very low at stratospheric altitudes, and it is, in fact, by temperature considerations that the stratosphere is defined. Above 36,000ft. the temperature does not decrease but remains constant at −56.5 deg. C., more than "half-way to boiling point" below freezing point! Though very low, this temperature can be dealt with by special heated clothing or by heating the air of the cabin from the waste heat of the engine.

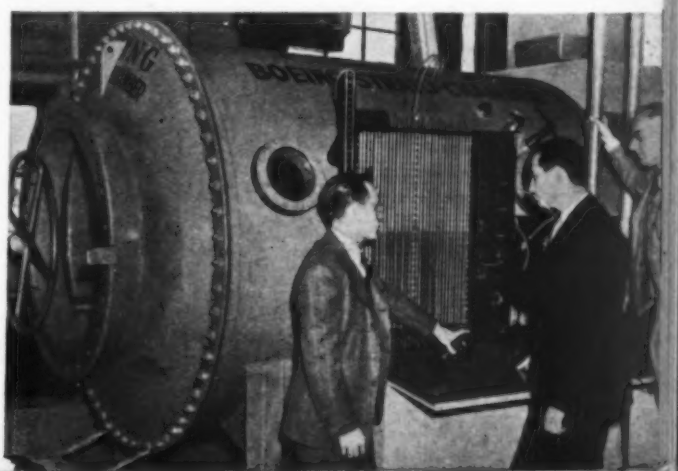
Supercharging the Engine

Supercharging is universal practice to-day but to supercharge for heights of up to 40,000ft. has many difficulties. The great pressure difference is too large for one supercharger to handle, and two arranged in series—in other words, a two-stage supercharger—must be used. When air is compressed its temperature rises because of the work done on it, and this calls for an intercooler between the two stages. A two-speed drive to the supercharger is also common practice so that the supercharger can be driven at a lower speed at the lower altitudes to prevent waste of power where its full blower pressure cannot be utilised. So two-speed, two-stage superchargers with intercoolers can become a very complicated part of the modern high-altitude aero engine.

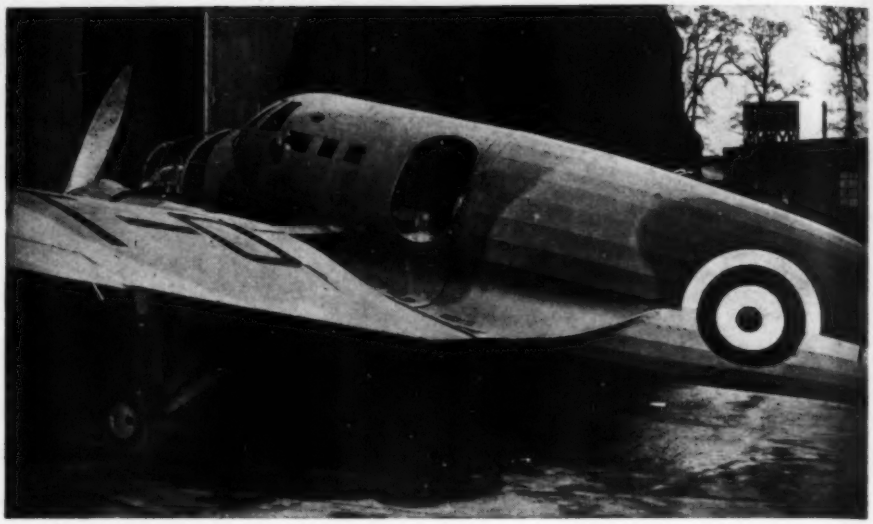
Another possibility is the exhaust-driven turbo-supercharger. As altitude increases, the pressure difference between the exhaust gases and the atmosphere becomes greater, so the power available to drive the supercharger increases. This is just the effect that has been sought in the two-speed drive. Unfortunately, the exhaust gases are at such high temperature that there are very few metals which will stand up to them, coupled with their terrific eroding velocity and the tremendous revolutions per minute of the turbine. Turbo-superchargers are not general practice yet, but several aeroplanes have been built with them, and the experimental Lockheed XC-35 was so fitted. Very like an Electra, it had two 550 h.p. Wasps.

The arrangement of a typical turbo-supercharger is shown in the drawing. It will be seen how the exhaust gas (A) is made to drive a turbine (I) which has two centrifugal pumps on the same shaft. The larger is the engine blower and the smaller (W) provides the pressure for the passenger cabin. The "blast gate" (E) has the same function as the throttle; if opened it by-passes the exhaust to atmosphere and so slows the turbine and lessens the boost pressure. Normally it is controlled by the aneroid capsule (G) but this can be over-ridden by the pilot from the cockpit (X). (The other letters in the drawing indicate: B, intake; C, exhaust piping; D, carburettor; F, intercooler; H, nozzles; J, fuel tank; K, nozzle box; L, air collector ring; M, air compressor; N, fuel-pressure regulator; O, hand pump; P, engine-driven fuel pump; Q, flexible drive; R, fuel strainer; S, fuel selector cock; T, fuel line to auxiliary tank; U, fuel-pressure gauge; V, oil-pressure gauge; Y, oil-pressure connection on engine; Z, intake air-pressure gauge).

The turbo-supercharger is coming more and more into favour as engineers grapple with its problems, and will be fitted to an increasing number of engines in the future.



For high-altitude research and test the Boeing Company has this elaborately equipped chamber.



(Above) A Gloster Gladiator of the Met. Flight climbs off to the stratosphere on its daily flight.

In the General Aircraft machine the pressure cabin extends from the nose to just aft of the door. This is the only pressure cabin machine whose existence has been announced in this country. The engine and pump for "inflating" the cabin are housed in the nose.

Low pressure tends to vaporise petrol, and this can be a menace if bubbles of vapour form in the piping. It is also a waste if the contents of the tanks are allowed to vaporise to any extent. This is perhaps not as serious as might be thought at first, for it has been found that if the fuel has sufficient time to cool off in the ascent, its consequently decreased tendency to vaporise offsets the low atmospheric pressure. But it certainly reduces hazards on stratospheric flights to use one of the newer fuels which have been designed to have a lower fire risk by reason of their lower vapour pressure.

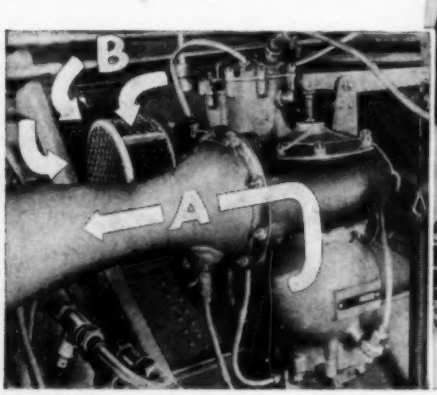
The Pressure Cabin

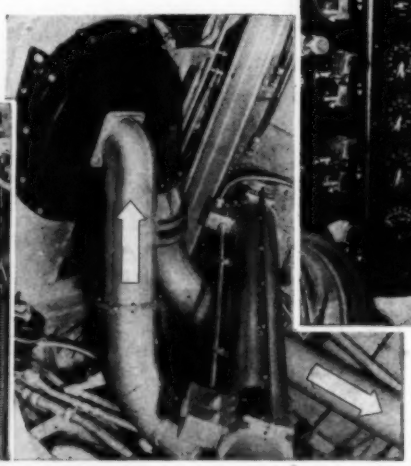
The General Aircraft experimental pressure cabin machine is the only one of its type whose existence is known of in this country. It has been flying for some considerable time, and is evidence of that company's enterprise in the field of modern air transport. Nothing can be said of what the company is at present doing with it.

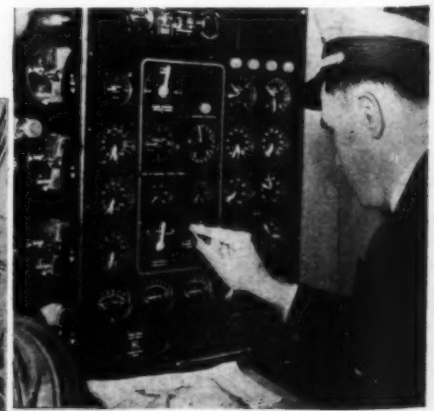
The Boeing Stratoliner is proof that all the problems of "pressurised" flight can be solved, for though this machine was not designed to fly at aerial combat heights, it meets many of the difficulties at its designed altitude of 20,000ft., but not in such severe form. The cabin pressure is not maintained at sea level value as this is unnecessary, but at never less than the equivalent of 12,000ft. Thus the pressure difference between cabin and atmosphere is 8,000ft. or 2½lb./sq. in. If a bomber is to operate at 40,000ft. with a 12,000ft. cabin pressure, the pressure difference for which the structure must be designed is 6.3lb./sq. in., more than twice as much.

These pressures may not seem to be very great, but

The cabin pressure installation on the Boeing Stratoliner. A indicates compressed air to cabin, and B is the spent air outlet.

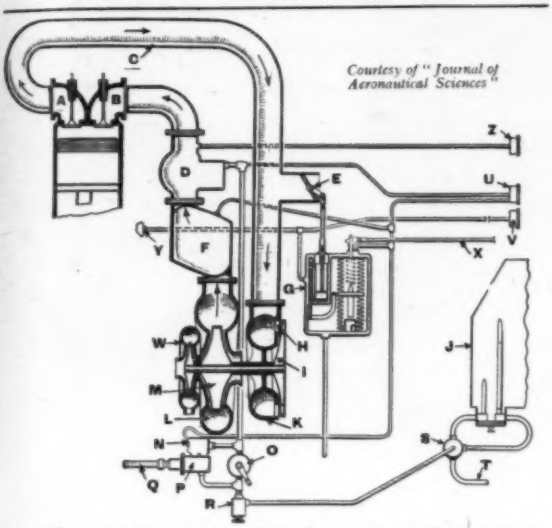






Centre shows one of the engine-driven pumps, while on the right the cabin pressure instruments are seen within the white line on the flight engineer's board.

HIGH-ALTITUDE FLIGHT



they have to be resisted by fuselage surfaces of large area, and the metal skin tends to bulge in between the stringers and frames. This is known as "quilting." Leaks can be prevented by using a strip of fabric in each riveted joint. Doors are more difficult to make airtight, and it must not be forgotten that where controls pass through the fuselage side they must be provided with a gland to stop air leakage.

The difficulties of using guns in a stratosphere bomber are evident. It might be possible to mount each one going through the side of the fuselage with an airtight ball joint. There is smoke disposal to be thought of and also the air leak outwards when the breach is opened, but these two factors may be mutually helpful. The only other way is to mount the guns outside and have them remotely controlled. Fortunately, ice formation would probably not be a trouble because the stratosphere air is dry, but it would be necessary to see that the guns could operate at the very low temperature. It may be that high-altitude military craft cannot be of the pressure cabin type, but must be flown by crews each member of which is clad in a pressure suit. Such a design obviates the trouble of a cabin holed by bullets or shells, which might well release so much pressure that the crew would become unconscious. But there is proof that the purely structural problems can be solved, for the Lockheed XC-35 fuselage has been tested up to a pressure difference of 15lb./sq. in., which makes it more than able to deal with the 6.3lb./sq. in. needed for flight at 40,000ft.

On this pressure test in the factory there were many curious observers, and when pressure was applied some of the small leaks gave out whistling sounds. The less curious started to walk slowly towards the door. But as the pressure increased the whistles turned to screeches, and only the very curious were left with those who were conducting the test. The others had bolted.

Records

Knowledge of the stratosphere is as yet very limited, but Man's insatiable thirst for knowing the unknown has made him search for its secrets. The aviation engineers, using the term in its widest sense, have sounded the stratosphere for its use as an aerial highway and as an aerial tiltyard, but the scientists, who do not concern themselves with utility, have other objectives. One of their main concerns is to determine the nature of certain mysterious emanations which have been given the name of "cosmic rays." Where they originate is not known, but they are of extremely short wavelength and have quite remarkable penetrating

The cylindrical pressure-resisting shape of the Boeing Stratoliner's fuselage is very evident in this photograph.

In this layout of a typical turbo-supercharger the exhaust gases drive a turbine which drives two centrifugal pumps; one blows the mixture into the cylinders and the other supplies compressed air to the cabin.

powers. The rays emanating from radium, which are of greater wavelength than the cosmic type, are made to look exceedingly weak by comparison. Whereas they only need a thickness of a few inches of lead to stop them, the cosmic rays require very many feet.

Ascents by balloon offer the best opportunity of studying such phenomena, and the Russian attempts and those of Professor Piccard will be remembered. But the balloon record is held by the Americans, Capts. Anderson and Stevens; they rose to a height of 72,395ft. in *Explorer II* at South Dakota in 1935.

But though they cannot go to the towering altitudes of balloons, aeroplanes have also been frequent visitors to the stratosphere. Even the seaplane gets there, and the present altitude record for seaplanes stands at 38,559ft. It is held by Lt. Apollo Soucek, of the U.S. Navy, and was made in a Wright Apache biplane with a 425 h.p. Pratt and Whitney engine at Washington in 1929.

At the behest of those who wish to put the stratosphere to use, the landplane has gone considerably higher and Britain has been in the forefront of these attempts, although we do not at present hold the record. Going back to 1936, Sqn. Ldr. Swain's flight in the Bristol 138 gained him the record. He reached a height of 49,944ft. Very shortly after this, in 1937, Lt. Col. Mario Pezzi recaptured the record for Italy by reaching 51,362ft., but Britain regained it in June of the same year, when Flt. Lt. Adam took the same Bristol 138, slightly improved, to an altitude of 53,937ft. The present record is again held by Mario Pezzi; it was made in October, 1938, in a Caproni biplane with a Piaggio XI-RC engine, and stands at 56,032ft.

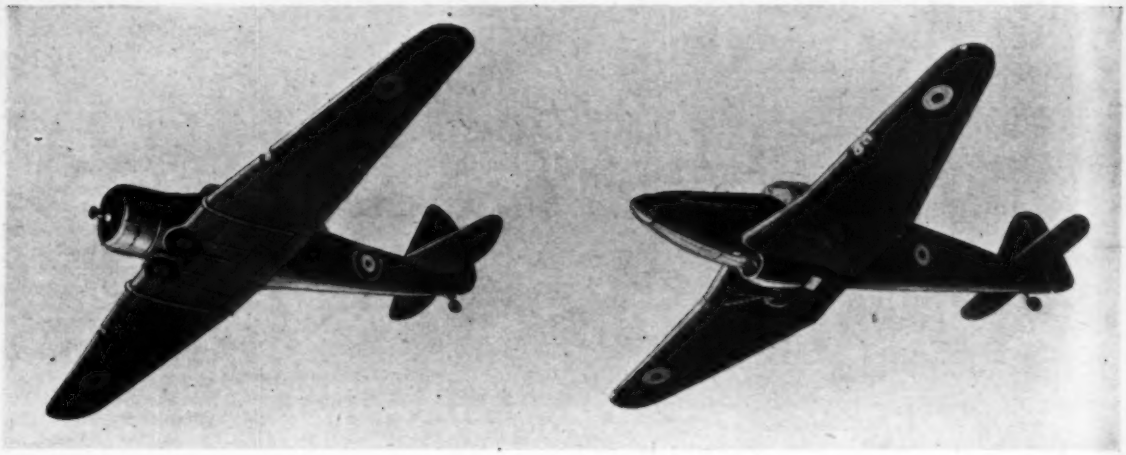
There is much information available on how to conquer the problems of high-altitude flight and there is no doubt that every ounce of military value will be extracted from it for use in this war, particularly by the Germans, who have shown an astonishing capacity in this direction. But if bombers go to the stratosphere, so will fighters and so will anti-aircraft fire, for this is merely a question of increasing the calibre.

The "soap test." To find leaks in the Stratoliner the seams were painted with soap solution while the body was blown up.

Twenty-second of the Series

FRIEND or FOE?

These British and American Trainers are Familiar Types

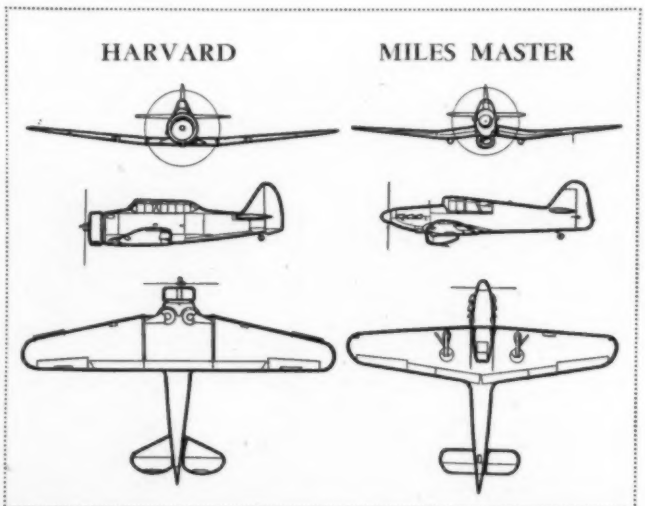


North American Harvard. Low-wing set well forward, pronounced backsweep to leading edge, straight trailing-edge, small rounded tips, dihedral from centre-section. Radial engine, no spinner. Long transparent cover to two-seater cockpit. Large fin and rudder with sloping leading-edge and curved apex and trailing-edge. Tailplane leading-edge backswept, curved elevators.

Miles Master. Cranked, low-wing, thick at root: moderate taper on both edges to round tips. In-line engine giving nose similar to Hurricane, with rounded spinner. Large radiator beneath centre-section. Large transparent top to two-seater cockpit. Large symmetrically tapered fin and rudder with round apex. Straight, parallel edges to tailplane.

BOTH of these trainers are a familiar sight in many parts of Great Britain, and the Harvard has the distinction of being about the only aircraft which really can be identified by its sound, its direct-drive airscrew being responsible for a characteristically loud, crisp noise even at cruising speed. The Master, on the other hand, is readily identified by its cranked wings. It is true that it somewhat resembles the Ju 87 in this respect, but as the latter has a fixed undercarriage and is a thoroughly angular, untidy-looking affair, there should be no fear of any confusion after the first glance.

Both these machines will be seen flying at fairly low altitudes so that, even with the naked eye, their main characteristics should be clearly discernible under conditions of reasonably good visibility. In plan, the wings of the Master have a moderate degree of taper on both edges and comparatively small, rounded tips. The undercarriage retracts backwards into the thick centre-section, the wheels being rotated through 90 degrees so that they lie in recesses. The cantilever tailplane, attached at the base of the fin, is of comparatively high aspect-ratio and has straight parallel edges and round tips. When seen from the head-on position (from which angle the characteristic cranking of the wings will, of course, be obvious) the rounded bulge of the large radiator beneath the centre-section will provide a useful guide. This unlovely goitre-like excrescence (which ruins the bottom-line of the fuselage) is, of course, equally prominent when the machine presents a side-view.



A typically Miles note is struck by the windscreen which, instead of being raked backwards in the usual way, has a slight but unmistakable forward "bulge" like the forehead of a Mabel Lucy Attwell baby. The top-line of the cockpit cover, however, makes a clean line with the after-deck of the fuselage right back to the fin, which, with the rudder, is noticeably large though well proportioned and nicely rounded at the apex.

Chief characteristics of the Harvard—apart from its noisiness—are its short, blunt nose and the pronounced backsweep to the leading-edge of its wings. Probably no other aircraft has its wings set so very far forward, and the snub-nosed effect is still further emphasised by the bulge on either side, immediately behind the cowling of the radial engine, within which the inwardly retracting undercarriage stows its wheels.

The cover of the two-seater "cabin" forms a long, transparent hump above the deep fuselage, and the broad base-line of its large fin and rudder further reduces its apparent length. The cantilever tailplane is typically American with its backswept leading-edge and gracefully rounded tips and elevators.

A characteristic of all British training aircraft is their bright yellow finish. In peacetime the whole machine was finished in this conspicuous colour, but under wartime conditions, it is limited to the undersides of the wings and tailplane and the lower half of the fuselage, all upper surfaces being camouflaged.

Next week: D.H. Tiger Moth and Miles Magister.

ROYAL AIR FORCE BASES IN MALAYA

Provision Against Attack : Modern Equipment and Skilled Asiatic Craftsmen

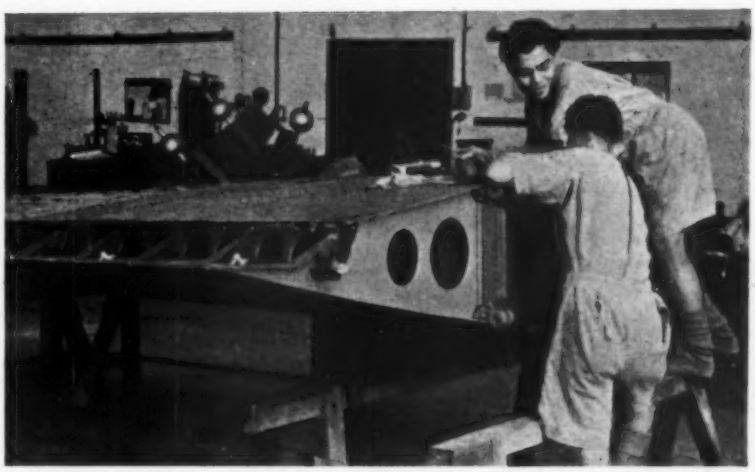
(Right) A general view of one of the big workshops showing men busy on crankcase assemblies.

(Left) Obsolete types are used for instructional training. Three young Malayan mechanics at work on an Avro wing.

THE Commander-in-Chief (Far East), recently visited an R.A.F. station "somewhere in Malaya" which is one of the many air bases in that country supplying the requirements of the greatly increased air forces operating in the Far East. Like the Singapore Naval Base and other air stations in this country, it possesses the advantage of covering a vast area which allows buildings such as workshops, hangars, power houses and barrack blocks to be scattered in such a manner as to make it almost impossible for them to be destroyed by means of air attack, while remaining readily accessible to one another. Every building is specially protected against air attack, while all the vulnerable points are proof against a direct hit by a heavy bomb. For the protection of personnel, air-raid shelters have been built.

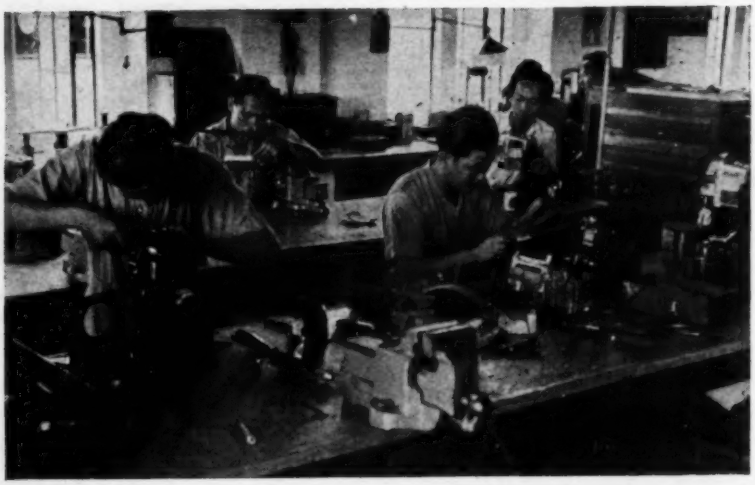
Apart from being an air base from which it is possible to operate every type of aircraft, this station possesses extensive workshops with facilities to carry out the complete overhaul and repair of the largest and most modern types of aircraft. The workshops, including the aircraft repair section and the engine repair section, are equipped with every type of the most modern machinery, and organised in a manner to enable repairs to be carried out as rapidly as possible. In these workshops the repair of all-metal main planes, fuselage, aircraft instruments, aero engines and armament was seen to be proceeding in successive bays, and the hundreds of skilled men engaged on this type of work presented a most impressive sight.

A certain amount of the technical work is carried out by the Asiatic Technical Corps under the supervision of skilled R.A.F. personnel. This Corps is of comparatively recent for-



THE ROOT OF THE MATTER : Young Asia soon learns how to handle the most modern designs—such as the all-metal wing shown here which is being overhauled by native skill.

ROYAL AIR FORCE BASES IN MALAYA



(Above) Ensuring the requisite number of sparks in a magneto repair shop.

mation, September, 1939, and all the men in it are specially selected from the most skilled Asiatic craftsmen that Malaya can produce. The majority are drawn from the technical trade schools of Malaya with whom the Air Force has come to an arrangement by which they are specially trained for aircraft repair and construction. Experienced Royal Air Force technical officers speak very highly of the skill of these Asiatic mechanics and say that they compare favourably with Royal Air Force tradesmen. In the short time that the Corps has been formed some of the men have already risen to the rank of sergeant

Apart from the repair shops and hangars, the torpedo section proved to be one of the most interesting sights. This section is one of many responsible for the maintenance, repair and storage of hundreds of torpedoes which are required by the squadrons of torpedo bombers operating from bases throughout Malaya. These aircraft are flown by men drawn from all the corners of the Empire and their ranks have been recently reinforced by a number of New Zealander pilots. If used against an enemy fleet or transports moving to attack any British possessions in the Far East they would prove to be one of the most powerful and deadly striking forces with which the attackers would have to contend.

The domestic comfort of the personnel of this huge station has not been neglected by the authorities, who have always given considerable attention to the housing of men of the Royal Air Force stationed in Malaya. The men's quarters are built specially for tropical conditions, with large, cool, airy barrack rooms, restaurants, recreation rooms and cinemas, all of which help to ameliorate the tropical heat. At most R.A.F. stations the modern swimming pools give airmen and their families an opportunity to enjoy the pleasure of bathing and also to cool off after a hard day's work. In addition, golf courses are often laid out, while for those who feel the need of more strenuous exercise there are extensive playing fields.

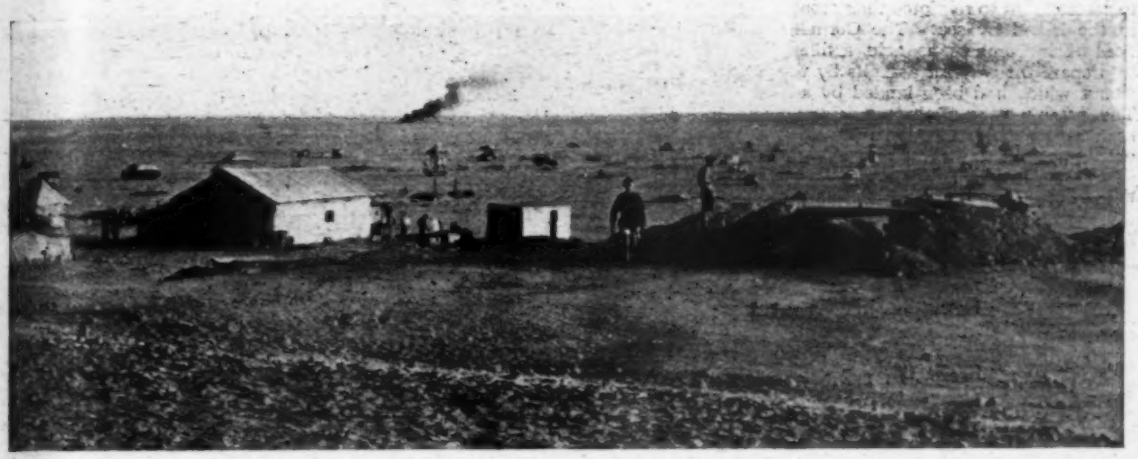
A visit to any of the modern aerodromes in Malaya is sufficient to demonstrate that all the defences and facilities of these bases have rapidly become completely modernised as a result of the lessons learned from the European War. Singapore has become one of the most important centres of air power in the British Empire and, if it became necessary, its enormous defensive strength, combined with its striking power, would ensure superiority over the enemy from the very beginning.

(Above) Alfresco adjustments are not uncommon, and a wall of sandbags protects these flight-riggers from possible harm while at work on an aileron.

—AND IT COMES OUT HERE: A dusky wireless expert reassembles an aircraft's radio set after effecting necessary repairs.

War in the Air

F.A.A. Torpedoes Again : The Catalinas : Air-borne Invasion of Crete : U.S.A. Aircraft in the East



THE MOTH AND THE CANDLE : Although Tobruk is more or less besieged, enemy aircraft are likely to have their wings singed on approach. A German machine burning in the desert.

THE sinking of the German battleship *Bismarck* caused great rejoicings throughout the British Empire and scarcely less in the United States. One can imagine also the encouragement it must have brought to the people of the conquered countries when the news reached them, for it gave clear proof that Britannia still rules the waves.

The whole operation, in which naval forces from all sides, including Admiral Somerville's Western Mediterranean squadron from Gibraltar, converged on the German, was one of the most elaborate and skilful operations in the history of naval warfare. All the same, in such a wide expanse of water the *Bismarck* was not easy to shadow. Visibility was sometimes very poor, and the German captain turned and twisted in the effort to throw off his pursuers. He might have succeeded but for the Fleet Air Arm and the Coastal Command. The Catalinas and a Sunderland of the latter found the German ship when she had temporarily been lost by the British cruisers, and hung on her tracks with dogged determination. The Catalina which first found her was in the air for 18 hours, while another flying boat of the same type put up a record by making a sortie which lasted for 27 hours.

"It was the hottest fire I have ever been under," said the pilot of one Catalina. "There was lots of cloud and the weather was misty and hazy. We had ducked into the cloud and were trying to edge around the *Bismarck*. Suddenly we came to the end of our particular cloud and I found myself bang over the ship, which was only about 400 yards away. I thought they had us. She put up the worst barrage I have ever seen. She seemed to be one big flash from bow to stern and must have been turning loose on us everything she had.

"The *Bismarck* apparently thought we were going to bomb her, because she turned a full 90 degrees off her course when we ran out of the cloud, and opened fire as she was turning. I really don't know how we managed to dodge all the stuff she threw up. It was a ticklish moment and we were lucky to get back into the cloud, but the Catalina went on flying throughout the operation, despite the holes in the hull. I had several members of the crew busy stopping the holes so that we wouldn't sink when we landed on the water at our base."

Deadly T.S.R.'s

THE speed of the *Bismarck* was reduced by the T.S.R. aircraft of H.M.S. *Victorious* (in action for the first time) and *Ark Royal*, which delivered repeated attacks with torpedoes. Destroyers then got in hits with the heavier torpedoes which surface ships are able to use, and finally the enemy battleship was brought to a standstill. The battleships of the Royal Navy then regained contact and evidently knocked out the enemy guns. Finally the cruiser H.M.S. *Dorsetshire* was detailed to sink the *Bismarck* with her torpedoes, and the great German battleship disappeared from the surface of the Atlantic. H.M.S. *Hood* was avenged.

The Board of Admiralty sent a message of congratulation to the Fleet, in the course of which their Lordships remarked:

"From the information at present available to their Lordships there can be no doubt that had it not been for the gallantry, skill, and devotion to duty of the Fleet Air Arm in both *Victorious* and *Ark Royal*, our object might not have been achieved."

The following signals have been exchanged between the Admiralty and A.O.C.-in-C., Coastal Command:—

From Admiralty to the Air Officer Commanding-in-Chief, Coastal Command.—"Admiralty wish gratefully to acknowledge the part played by the reconnaissance of the forces under your command which contributed in a large measure to the successful outcome of the recent operation."

To the Admiralty from the A.O.C.-in-C., Coastal Command.—"Your message very much appreciated and has been repeated to all concerned. It was a great hunt and we are eager and ready for more."

Meanwhile, the closing days of the month of May witnessed a battle in Crete such as had never been fought before, and indeed had not been contemplated or foreseen by those who had speculated about the new tactics which the aeroplane must introduce into war. One side, the Germans, holds complete command of the air, while the British have equally com-

plete command of the sea. In the land fighting the former have no heavy tanks or heavy guns, and cannot have many even light specimens of those two weapons; while the British and their Allies have some artillery, but exactly what and how much is not known. The invaders have poured men in by air, regardless of appalling losses, while the British are contriving to some extent to reinforce their troops in the island by sea. The Germans used their bombers as field artillery to prepare the way for assaults by the troops which had been landed by air. The pilots of the Stukas understand such tactics well, and carried them out with great efficiency and any amount of dash. Their losses, too, were heavy, but they have not damped the determination of the pilots. The land fighting has been furious and continuous.

The critical spot has been the aerodrome of Maleme, near Canea. At first it was under the fire of the British guns, which took heavy toll of the Ju 52 troop carriers. But parachute troops could come down outside the aerodrome, and the gliders which were towed by the power aircraft could land almost anywhere. A despatch from Cairo, dated May 28th, said that by then the invaders had practically stopped using parachutes and gliders, which would mean that Maleme aerodrome was by then out of the range of the British artillery and that the craters on its landing ground had been filled up. The Germans had driven back the defenders of Canea from their first lines, and no doubt the artillery had had to fall back as well. Precise information from Crete had not been received up to the moment of writing, but it was believed that from two to four gliders, each probably holding from six to eight men, would be towed by one aeroplane.

Of course, R.A.F. bombers attacked Maleme, and it would seem probable that taking off from there must have been a parlous business. It was as a landing ground rather than as a working aerodrome that the Germans were using the place. No doubt a Ju 52 would lose no time in taking off again the moment after it had disgorged its load of soldiers, but many of the troop-carriers were bombed to destruction on the ground by the R.A.F., and many, too, were shot down in the air before they landed.

The Need for Fighters

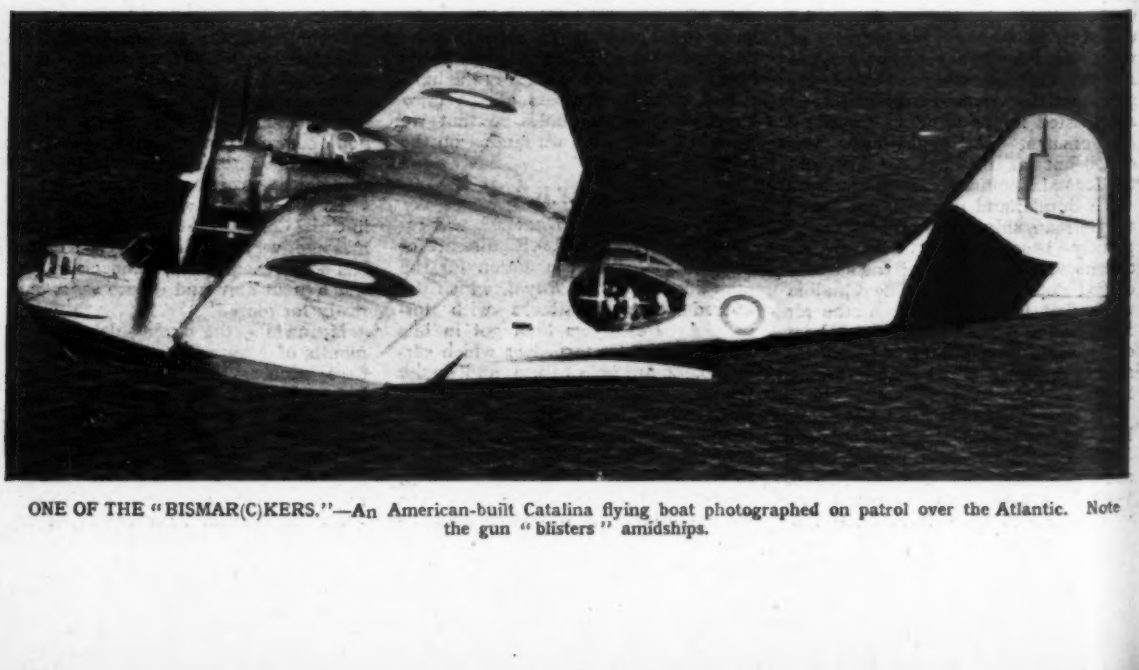
FOR the British and Allied troops in Crete it was the same old story of lack of fighter support. In every land campaign in this war the Army has suffered from that heavy drawback. In this case it was inevitable. The fighters which had reached Crete from Greece had to be withdrawn to save them from useless extermination, and doubtless General Freyberg, V.C., approved of the step. It is generally admitted now, as a result of our own experiences during the Battle of Britain and also from the case of Stavanger, that air bombing is unable to prevent a well-organised aerodrome from operating; but one in a state of improvisation, devoid of adequate anti-aircraft defences, cannot continue to function in the face of persistent bombing. If our fighters had been left in Crete they would have been in as hopeless a position as the squadrons which tried to operate from frozen lakes in Norway. So the Stukas were left with things all their own way. Crete is only some 120 miles from Greece (a bit further from the aerodromes in the Peloponnese), whereas the British base in Egypt is about 350 miles distant. Long-range fighters have flown across from Egypt and have taken some toll of the German aircraft over Crete, but their efforts could make no appreciable difference to the continuous influx of German air-borne troops. Of the carriers H.M.S. *Formidable* and *Eagle* not a word has been heard, but it would be rash to expose them to such risks. They have proved themselves invaluable in fleet actions and in such actions as Taranto, but they are not intended to brave or to tackle swarms of shore-based bombers.

WAR IN THE AIR

Admiral Cunningham's fleet has likewise had to suffer continuous bombing without protection from fighters, and two cruisers and four destroyers were sunk by bombs. H.M.S. *York* was bombed in Suda Bay. But at this heavy cost the Navy has retained command of the seas and has prevented any convoy of enemy ships from landing their troops and material on the shores of Crete. The German losses of men at sea have run into many thousands, and in addition large numbers of German bombers have been shot down by the guns of the fleet. When the full detailed story of this prolonged battle is known, there will doubtless be many lessons to be studied about the use of aircraft in combined operations.

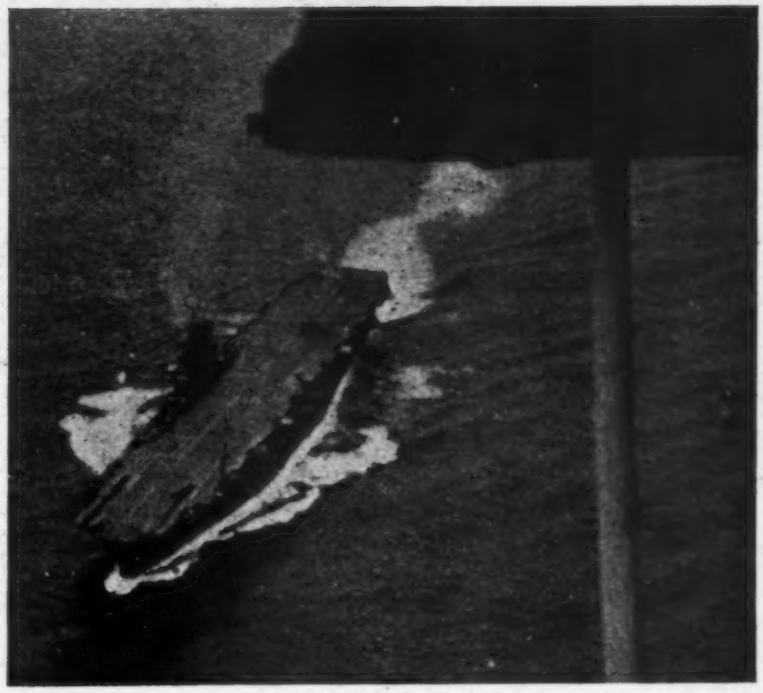
Probably in order to tie down British forces in North Africa, the Germans have been pressing on the Egyptian border round Sollum, and our men have had to evacuate Halfaya Pass. American help has begun to reach that part of the world, and some aircraft built in the States have been reported in action at Fort Capuzzo. In Iraq, too, American aircraft supplied to the R.A.F. have been in action, and in particular mention has been made of Tomahawks and Glen Martin 167 bombers at Habbaniya.

The Fleet Air Arm, always ready to help the R.A.F. when not urgently re-



ONE OF THE "BISMAR(C)KERS."—An American-built Catalina flying boat photographed on patrol over the Atlantic. Note the gun "blisters" amidships.

WAR IN THE AIR



THE JACK BOOT ON THE OTHER FOOT: After having been sunk several times by Axis propaganda the *Ark Royal* was refloated just in time to attend to the *Bismarck*. A recent picture taken from a Fairey Swordfish of the famous carrier under way.

quired for its proper duties at sea, has also sent help to Iraq.

During operations in Iraq a naval aircraft, which had been damaged while taking part in an attack on the barracks at Samawa, had to make a forced landing three miles south of the town and was quickly surrounded by members of Raschid Ali's forces, who opened fire.

Other naval aircraft, which had observed this incident, promptly landed, rescued the crew without casualty in the face of armed opposition, and once more took to the air.

Turning again to the Libyan theatre, occasional stories of individual pluck by British airmen reach this country, and the following is certainly worth putting on record.

Splendid pluck and endurance were shown by a young Pilot Officer engaged in an attack on the aerodrome of Gazala, Libya. Diving very low with a total disregard for the heavy ground fire, he sprayed two large enemy aircraft on the ground until they were completely destroyed. He then swooped on to a concentration of mechanised transport, braving a hail of machine-gun bullets. He received wounds in his head and shoulders and was losing blood rapidly when he turned his aircraft towards the Egyptian frontier, 250 miles away. Lacking sufficient strength to reach his squadron's base, he made a successful landing within the British lines, where he fainted as he was helped from the cockpit.

It is a relief for the chronicler to turn to Abyssinia, where everything continues to go well. Though the Sovereigns of Norway, Holland, Yugoslavia and Greece have had to fly before the Germans, it is some consolation to reflect that a Viceroy of the King of Italy is a prisoner in our hands, while the rightful Emperor of Ethiopia is once more seated on his throne. Both large and small bodies of Italians and their African auxiliaries have been surrendering, sometimes after a good fight, sometimes from sheer hopelessness. The South African and Rhodesian Air Forces have been invaluable in keeping track of the enemy movements through the wild country, and in bombing positions whenever the Italians attempted a stand. Field Marshal Smuts (that promotion has given great gratification throughout the Empire) has announced that the South African Army would soon be leaving Ethiopia for Egypt.

The R.A.F. have sunk an ammunition ship in the harbour of Sfax, in French Tunisia. It had been under Italian escort.

AIRCRAFT PRODUCED BY THE LATE LORD AUSTIN

ALTHOUGH the name of Lord Austin, who died in his seventy-fifth year, was chiefly associated in the mind of the public with the popular make of motor car bearing his name, his interest and activities in the world of aviation go back to the war of 1914-18.

Not only did the Austin concern, during that period, share with a number of other firms in producing the Farnborough-designed S.E.5a, which was one of the most successful single-seater fighters, but in the later phase of that first-war-to-end-wars it was responsible for the introduction of a two-seater fighter, known as the Greyhound, which, however, was overtaken by the armistice before it actually got into production. Powered by a nine-cylinder, air-cooled radial A.B.C. "Dragonfly" engine of 320 h.p., it was quite a fast machine for its day, with an estimated top speed of 130 m.p.h. Another Austin aircraft of about the same period was the Austin "Ball" single-seater fighting scout, which had a 200 h.p. V-type, water-cooled Hispano-Suiza engine driving a four-bladed airscrew, and which was slightly faster than the Greyhound. It was, as its name indicated, designed to the ideas of the famous Capt. Ball, V.C. Both these machines were, of course, biplanes.

Experiments were also carried out with a single-seater triplane fighter, but the machine never actually reached the production stage.

The interest of Sir Herbert Austin (as he then was) in aviation did not evaporate with the cessation of hostilities in 1918, for the following year he placed on the market a £500 single-seater light aeroplane designed by John Kenworthy specifically for the owner-pilot. This was the Austin Whippet, and it had an airframe of steel tubular construction and folding wings. The original design included a flat-twin engine of 45 h.p., but this was replaced in the production model by a five-cylinder radial Anzani engine rated at 50 h.p., and the little machine can be reckoned as the first practical light aeroplane just as the famous Austin Seven was the first really practical small car to be produced for the owner-driver.

But although the British motoring world showed it was ready for such a car as the Austin Seven in 1922, the immediate post-war Briton was not ready to take advantage of the possibilities held out in the sphere of aviation by the Austin Whippet; it was, in fact, a little before its time. Perhaps, also, its being a single-seater did not help, but, whatever the reason or combination of reasons, the Whippet did not "catch on" in the way Sir Herbert's first "baby" motor car was to do some three years later.

Created a Baron in 1936, Lord Austin became chairman of the Shadow Aero-engine Committee the following year and remained in this office until 1940. In the meantime the organisation of which he was the head had again busied itself in the production of warplanes, starting to help in the rearmament plan by building Fairey Battles. The production of aircraft continues, of course, to be one of the vital Austin activities at the present time.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

PHILATELIC PHILANTHROPY

Old Stamped Envelopes Wanted for Red Cross

IN offices, factories, large stores, laboratories, inns, hotels, breweries, distilleries, in the home itself hidden away in desks, drawers, boxes or in lumber rooms are letters of years ago. Many repose in the stamped envelopes in which they were sent, and which are not essential for the continued preservation of the correspondence itself. May I appeal to your readers to make a search for such old envelopes bearing stamps of early issues and to send them as soon as possible as a gift to be auctioned for the Duke of Gloucester's Red Cross and St. John Fund?

W. K. SKIPWITH,
Secretary, Philatelic Section,
Red Cross and St. John Fund,
24, Carlton House Terrace, S.W.1.

HUMAN TERMINAL VELOCITY

Two Statements Made by John Tranum

THOSE who have, like Mr. Ralph Barnaby, queried the accuracy of the values submitted for the terminal velocity of the human body (*Flight*, May 15) may find interest in the statements of the late John Tranum in his book, "Nine Lives."

On this subject he remarks: "After he has dropped about 900 feet he reaches his maximum speed of 119.6 m.p.h. and continues at this speed, and no faster, until his delayed drop is over. The maximum speed was first figured out by the U.S. Army Air Corps. . . . That is why I say there can be no limit to the delayed drop record."

Later, referring to his ambition to break the record of 15,000 feet established by Bud Manning, of the United States, he continues: "Experts told me that the human heart could not possibly stand the rapid change of pressure necessitated by falling at the rate of 144 miles per hour, or nearly 13,000 feet per minute."

The previously mentioned discrepancy is again apparent, and I leave it to others to comment where necessary.

G. A. CHAMBERLAIN.

THE AMERICAN FIGHTER

Good, But Not Quite "Hot" Enough—Yet

TO win this war we must keep "on top" in the air. The Battle of Britain was won by the superior quality of our men and our aeroplanes, directed by brilliant staff work. At that time inferiority of numbers was a worry, but we won through.

Since then we have made big strides in the direction of numerical superiority, and, therefore, the policy of quality before quantity has even greater justification than it had last summer.

I do not agree with the statement (in Mr. J. I. Waddington's article on "The American Fighter") that the Curtiss Tomahawk has "reached a final form which is comparable with our own front-line fighters." In a mock fight this latest American fighter to go into service with the R.A.F. was put up against a Hurricane which was fighting in France last summer. According to published information the armament and top speed are inferior to those of the Hurricane, but in climb (at low levels) it is superior. It has been announced that our later type Spitfires have a top speed of 387 m.p.h.; from which it would seem that the Rolls-Royce Merlin in its latest form must be developing about 1,300 or 1,400 h.p. These aeroplanes (armed sometimes with cannon) and Hurricanes with the same engine are the contemporaries of the Tomahawk.

It is essential that the lessons learned in air warfare are put into practical effect by the aeroplane constructors at once. For instance, 8-gun fighters were considered the right thing by the R.A.F. in (I believe) 1935; by the summer of last year they were proved to be right. This summer American aeroplanes originally designed for two guns are being delivered with four or six guns; whilst we are thinking in terms of cannons or twelve guns.

We and the Americans *must* get together and see to it that the R.A.F. gets what it really wants. America is supposed to be the country of "hustle" and now is the greatest need to demonstrate that quality.

We need all the help we can get from America, but quality must come first, if we are to keep faith with those who broke the *Luftwaffe* last summer.

E. N. B. BENTLEY, A.F.R.Ae.S.

DOUGLAS B-19 INSURANCE

It Would Be Cheaper in England—Perhaps!

I SUPPOSE it is inevitable that in the stress of war *Flight* has an occasional lapse. Your note on page 348 of your issue of May 15th dealing with flight test insurance, while making my mouth water, is quite beyond the realms of truth. Actually, the rate quoted would probably cover the whole range of initial trials, which I am glad to note will take place shortly. (The sooner the better at the rates you have published!)

A. G. LAMPLUGH,
The British Aviation Insurance Company, Limited.

[We are interested to hear from no less an insurance authority than Capt. Lamplugh that the rates reported from Los Angeles for the insurance of the giant Douglas B-19 are "quite beyond the realms of truth." £20,500 for the first minute of flight of a £250,000 aeroplane is a premium of 8 per cent. which, no doubt, is very high. We cannot agree, however, that the insertion of the paragraph had anything to do with "the stress of war" or was a "lapse"; the figures were contained in a report from Los Angeles and seemed to us reasonable for an American company. Of course, our own insurance companies are practically philanthropists and would have been much more generous—or would they?—ED.]

R.A.F. BENEVOLENT FUND

Conditional Offer of £1,000 in War Bonds

I HAVE received a letter from a patriotically minded citizen who is willing to give to the Royal Air Force Benevolent Fund £1,000 (one thousand pounds) in 2½ per cent. National War Bonds if 19 others will do the same.

He makes two conditions: (*a*) that one or more of the leading newspapers will assist by publishing a letter from the Royal Air Force Benevolent Fund saying that such an offer has been made; (*b*) that his name shall not be made public.

As chairman of the Appeals Committee of the Royal Air Force Benevolent Fund I shall be glad if you will insert this letter in your paper, in the hope that this generous offer will be emulated by other public-spirited persons and so enable the Fund to take advantage of the splendid opportunity mentioned above.

RIVERDALE,
Chairman of Appeals Committee.

TWIN ENGINE INSTALLATION

Suggestion for Eliminating Side Thrust

IN a letter published in *Flight* on March 6 Mr. A. B. Galuszka suggested that in the case of twin-engined aircraft the side thrust encountered when one engine stops could be overcome by keeping the nacelles as close to the fuselage as possible, or, better still, by bringing both engines within the fuselage, although this involved the complication of two side airscrew propulsion.

This experiment of bringing the engines into the fuselage has already been carried out and the aircraft flown. I refer to the Lockheed aeroplane (the "Altair," I think it was called) which was produced about 1934.

On this machine two in-line engines were placed side by side in the nose of the aircraft and small-diameter airscrews used, so that there was about a 6-inch clearance between the tips on the centre line of the aircraft. This installation lent itself to the clean fairing of both engines in the fuselage and must have reduced drag considerably.

The above method does away with the complicated two-side airscrews propulsion intricacies, and, if progress warrants it, should be developed to a higher degree for much larger aircraft.

This is a very interesting subject, and perhaps will result in further discussion.

K. S. BELCHER.

ECONOMICS OF AIR TRANSPORT

Lockheed 14s of Trans-Canada Air Lines at 3s. 7d. per Mile

THE operations of Trans-Canada Air Lines for the year 1940 give valuable information on the cost of air transport. The fleet, consisting of 15 Lockheed 14H aircraft, together with six Lockheed Lodestars, which were purchased late in the year, flew the impressive total of more than 5,000,000 aeroplane - miles (actually 5,258,984). This flying occupied a total time of 32,552 hours, making the average ground speed of 162 m.p.h.

Total operating expenses were $4,592,383. which averages 77 cents (43 pence) per mile. (The rate for the previous year was 88.4 cents per mile.) The company receives payment for the carriage of air mail at the rate of 60 cents per mile, but after March 31, 1941, this rate has been reduced. The company, after paying interest on capital, had a surplus of revenue over expenses of $539,263 (10.3 cents per mile), so it seems that the reduction in mail payment should be at about this rate.

The annual report states that developments of the past year included the establishment of a second trans-continental service, of a service to Moncton from Montreal, and to London, Ontario, and Windsor from Toronto. It forecast the inauguration of a double daily service between Toronto and New York about April 15; an extension of the service to Halifax with two round trips from Montreal daily, and the possibility of a third trans-continental schedule later this year.

Gross revenue in 1940 was $4,592,383. Passenger earnings totalled $1,574,217; mail, $2,832,363; and express, $39,488. Operating expenses were $4,053,120, and included $2,637,313 for operation, maintenance and depreciation of aircraft; $974,645, operation, maintenance and depreciation of ground facilities; $301,256, traffic and general administration, and $187,500 interest on capital invested.

Revenue passengers numbering 53,180 were carried in 1940 as compared with 21,569 in 1939, an increase of 150 per cent. It was not possible to meet fully the demand for passenger service on a number of T.C.A. routes during the summer and early autumn months. The average passenger journey was 551 miles. The number of miles flown daily on regular service at the close of 1940 was 15,144, compared with 8,188 miles at the close of 1939.

Mail carried in 1940 was 927,037 lb., an increase of 65 per cent. over 1939. Air freight shipments totalled 105,788 lb., compared with 45,819 lb.

Property and equipment are shown at $4,858,548, less accrued depreciation of $1,332,154. Additions were made at Winnipeg during the year and construction of a 200-foot hangar was commenced at the new Montreal commercial airport (Dorval). The hangar at Moncton, construction of which was begun in the autumn of 1939, was completed early in the year.

The mileage of routes operated in 1940 was 3,662. At the end of the year T.C.A. was flying 15,144 miles a day. Since operations began in 1937, T.C.A. aeroplanes have flown 10,433,691 miles during 65,291 hours in the air.

During the year operations and traffic headquarters were transferred from Montreal to Winnipeg, and at the end of 1940 the staff numbered 789. Every phase of civil aviation has been affected by war conditions, and Trans-Canada Air Lines is no exception. The report regretfully records the loss of one of the original pilot group on active service overseas.

"The company's instrument shop at Winnipeg was doubled in capacity and is working full time in the overhaul and repair of aircraft instruments for the Royal Canadian Air Force. Under contract with the Department of Munitions and Supply, a shop was established at Malton airport, Toronto, for the overhaul and repair of military aircraft, and is now in operation.

"The facilities of the company at the various airports across Canada are extensively used for servicing military aircraft. Flying personnel of the company have assisted in the delivery of trainers purchased in the United States; in the ferrying of combat and training types between the different training depots in Canada; and in training civilian pilots proceeding overseas. A considerable amount of this work was done by employees in their own time as a contribution to the war effort."

It is noted that the Canadian arrangements for five round trips operated by British Overseas Airways Corporation over the North Atlantic last summer were handled by T.C.A. as their agent.

RADIO DETECTION OF NIGHT BOMBERS

THE call by the Hon. C. G. Power, Canadian Minister of National Defence, for 2,500 Canadians to enlist in the Royal Canadian Air Force as radio mechanics for service in the British Isles on the detection of bombers, reveals something of the nature of the device which is being developed for this work:

"The details," he said, "are of course secret, but I can say that in general terms it means that by using a great number of small radio sets of modern design, radio technicians posted at ground points all over the British Isles will be able to detect enemy planes in the air and direct anti-aircraft fire with deadly precision.

"The British Air Ministry expects great things of this invention, but like anything else it calls for men to make it work. For several months now we have combed Canada for amateur and professional radio men and rushed them overseas, but that source of supply is now dried up and we are ready to take green men, men of good education who have never seen the inside of a radio. We will train them in this new work and within a few months they will be holding key posts in the defence of Britain. Thirteen Canadian Universities have rallied to our aid to fill this urgent need.

"I do not like to over-state the case, yet I can say that it is of vital importance that we get these men, and that we get them immediately. We are not thinking in terms of months hence when we talk of radio technicians. The need is urgent. We are looking for 2,500 Canadians of good common sense who are ready *this minute* to volunteer for overseas service in a new service, one that will develop and grow, and one to which we are harnessing the initiative and zest of Canadian youth. Those who go into it on the ground floor will themselves be the ones to improve it—to invent, by tinkering and experience, a still greater defence to that fortress of the seas upon which our minds are now all so intently fixed."

Flight has already given information on both the German and American methods of detection of the night bomber (April 24th, page 302, and May 1st, page 312). The American system depends on a "radio echo," short wave being used because of its better reflecting properties and its greater freedom from interference by static. It is difficult to see how any other method can be used for bomber detection.

Canadian Air Transport Figures

COMMERCIAL aviation in Canada for 1940 showed an increase in passenger-carrying but a decrease in freight. Air carriers reported a total of 11,966,790 aeroplane-miles flown as against 10,331,782 miles in 1939, an increase of 16 per cent. Revenue passengers carried during the year increased from 110,862 in 1939 to 137,690, and non-revenue passengers decreased from 22,669 to 22,091. This was an increase for revenue passengers of 14 per cent., but because of the longer average journey, the revenue passenger mileage increased by 76 per cent. Weight of freight carried showed a substantial drop. For the year it amounted to 16,686,214 lb., as against 21,253,364 lb. in 1939. But the ton-mileage increased by 2.7 per cent. Mail carried increased by 57 per cent. to a total of 2,737,122 lb. and the mail ton-mileage by 57 per cent. also

BOOK REVIEWS

"Warplanes." (Real Photographs Coy., 1s. 3d.)

HERE is yet another booklet designed to aid in the identification of Allied and enemy aircraft. It is a handy size, 24-page booklet and deals with 12 British, seven German, two American and two Italian makes of aircraft, and, as the cover is marked "No. 1," it is evidently intended to follow it up with further editions. With the exception of the Hurricane and the Spitfire, which share the same page, each machine has a page to itself and an actual photograph of the aircraft in flight is supplemented by drawings stressing outstanding features and the usual available data.

* * *

A.B.C. of the R.A.F. Edited by Sir John Hammerton. (The Amalgamated Press, Ltd., 2s.)

IT would be difficult to think of any item of information concerning the R.A.F. which cannot be found within the 132 pages of this extraordinarily comprehensive and up-to-date cyclopædia. It is a complete guide to the varied and numerous activities of the Service and it represents a total of some 70,000 words of highly concentrated text matter generously illustrated with photographs and diagrams. Reference to any particular detail is made quick and easy by a general index and a table of contents.

It was inevitable, perhaps, that in compiling a work of such a nature, a few little errors should creep into the first impression—on page 23, for example, a Fairey Battle is described as a Miles Master, and on the coloured plate of medals the D.F.M. and the A.F.M. have apparently become interchanged—but we are assured that such accidental discrepancies have now been eliminated, and the appreciation of its admirable qualities expressed by Air Chief Marshal Sir Charles Portal in his preface is fully merited.

* * *

Flight to Victory By Ronald Walker. (Penguin Special, Allen Lane Penguin Books, 6d.)

IT is an honour for a writer to have a book accepted for publication as a Penguin Special, but it is not at all surprising that this honour should have been conferred on Mr. Walker's account of the R.A.F.'s first year of the war. It is in the main a sound, straightforward account of the remarkable success of our youngest fighting service, and rises to peak points of eloquent writing in the descriptions of the Gladiators in Norway and the German air assault on Britain. There are a number of well-chosen illustrations and a useful catalogue of air losses on both sides up to the end of December

* * *

War News Had Wings. By A. H. Narracott, air correspondent of "The Times." (Frederick Muller, Ltd. 8s. 6d. net.)

YET one more book about the air correspondents attached to the A.A.S.F.! The sub-title is "A Record of the R.A.F. in France," but that is hardly justified. It is a record of the personal doings of the author and some of his colleagues. As such it will doubtless be of intense interest to the author's family and circle of friends, but good folk who buy it on the strength of the sub-title will be disappointed. Incidentally, the A.A.S.F. was not the whole of the Air Force in France; there was also the Air Component, which is mentioned incidentally in this book.

Nevertheless, the book is readable, and is well written (except for one sentence on page 204, in which the pronoun "I" is used as yokels in the south-western counties use it, as the object of a verb) and the escape of the author from France is quite a good piece of vivid description.

* * *

"Speech Signals in Telephony." By A. Lloyd James. (Pitman, 3s. 6d.)

WRITTEN primarily to help those who have the important duty in wartime of establishing communication by telephone, this little book explores and explains very clearly and completely the various reasons for mistakes in telephoned messages and the means by which they can be avoided. Human speech being a method of conveying signals by sound, there are conditions, especially in wartime, when those sound-signals may suffer sufficient distortion to destroy their meaning. This can obviously happen when speaker and listener are separated by telephone lines or by miles of space as in the case of wireless telephony. Add to this separation such circumstances as a difference in dialect; when one or both is travelling at 350 m.p.h.; when pneumatic drills are busy outside the window; or shells bursting near at hand; when noise of one kind is rampant outside and noise of another kind rampant inside the headphones; when a degree of deafness is induced by service conditions; when fatigue is present and so on. Telephonic communication, either with or without wires, patently calls for a special technique if accurate reception is to be guaranteed under such conditions, and one can well understand that even the very context of a message can play an important part. Under this heading, incidentally, comes the classic example of the message, "Send reinforcements, I am going to advance," which was duly received and passed on as "Send three and fourpence, I am going to a dance," though doubtless this one was promptly referred back to the sender by its amazed and incredulous recipient.

Perusal of Mr. Lloyd James' book should do much to ensure important telephone signals being received accurately.

* * *

"Britain Under Fire," foreword by J. B. Priestley. (Country Life, Ltd., 6s.)

APPROPRIATELY bound in plain red, this book is a pictorial account of the destruction wrought by Germany's air attacks on Great Britain; it contains nearly 200 photographs of the damage done to British cities and towns by German bombers—to London, Coventry, Birmingham and Sheffield; to Southampton and Liverpool; to Bristol, Swansea and Plymouth; to Cardiff, Clydeside and Canterbury, and to little towns and villages in the Home Counties, Kent and elsewhere.

"It tells its own story and tells it in terms that a child could understand," says J. B. Priestley in his foreword. But he very properly reminds us that there is a larger truth behind these pictures because, though the camera does not lie, its truth is limited to what its eye can see. "The fact is," he adds, "that away from scenes like these, the tide of national life flows more strongly than it has ever done before" The national effort has not been interrupted; ordinary life goes on, too. On the other hand he points out that because most of this country is still untouched it would be a grave mistake to suppose that the whole air-raid business has been overstated and played up. "Our people in the places you see in these pictures," he says, "have been tested as no civilians have ever been tested before . . . make no mistake: courage and endurance were needed. . . ." And he records that they were found "still lit with humour and loving kindness."

This "two-fold story of a great crime and a still greater people," he concludes, tells the whole modern world that this—and if need be, worse than this—is the price we are prepared to pay to preserve what is best in our way of life. And to our children's children it will say, "We suffered all this that you might live as we had hoped to live"

* * *

"The Blue Book, 1941." (Benn Brothers, Ltd., 25s.)

THIS year's issue (59th edition) of the Blue Book, the electrical and engineering trades directory, which has just been published, maintains its comprehensive character in spite of paper rationing, this difficulty having been overcome by printing on thinner material. As a guide to names and addresses (postal and telegraphic) and telephone numbers of firms, persons and organisations in the industries concerned, it should be a valuable addition to the office library. Indexing is particularly good and projecting tabs enable one to open instantly at the required section. The first section is alphabetical and runs to some 370 pages; in the next the contents are grouped geographically by counties; the third section is arranged in trade classifications; the fourth is under trade names, and the final section under telegraphic addresses enabling incoming wires to be traced at a glance.

* * *

"The War in Maps." Edited by George Goodall, M.A. (George Philip and Son, Ltd., 1s. 6d.)

ECONOMIC and political world changes brought about since 1914 are graphically depicted in a series of coloured maps occupying some thirty pages.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

R.A.F. Benevolent Fund

FOLLOWING the recent announcement by Lord Riverdale that an anonymous citizen had offered £1,000 in National War Bonds to the R.A.F. Benevolent Fund if 19 others would do the same, the Fund has just received three more gifts each of £1,000. One is from Lord Swinton, a former Air Minister; one from Mr. Percy Lister, of the United Kingdom Commercial Corporation, Ltd.; and the third from Lord and Lady Riverdale. Each donor has given the sum outright, whether the £20,000 mark is reached or not. Naturally they hope it will be.

Lord Riverdale, who is also keenly interested in the A.T.C. movement, is chairman of the Appeals Committee of the R.A.F. Benevolent Fund. The other members are Mr. Colin F. Campbell, chairman of the National Provincial Bank; Mrs. Vesey Holt; Mr. J. F. Linney, President of the Auctioneers and Estate Agents Institute; Lord Luke of Pavenham; Viscount Nuffield; Mr. W. H. Senneck, who was closely connected with the late Lord Wakefield; Viscount Swinton; and Mrs. H. J. Tennant.

Awards

THE KING has been graciously pleased to approve of the following awards in recognition of gallantry displayed in flying operations against the enemy:—

DISTINGUISHED SERVICE ORDER.

Act. Wing Cdr. K. B. F. SMITH, No. 58 Squadron.—This officer has been engaged in active operations against the enemy over a long period. He participated in the first raid of the war, and since then he has taken part in numerous bombing missions over Germany in addition to many convoy escorts. Throughout the whole period he has displayed exceptional powers of leadership, courage and determination, and has undoubtedly contributed in a large measure to the operational efficiency of his squadron.

Act. Sqn. Ldr. R. SAWREY-COOKSON, D.F.C., No. 149 Squadron.—This officer has participated in numerous operational missions as captain of aircraft. His tenacity and determination to seek and destroy his allotted target have been most marked. This was particularly so one night in March, 1941, when, in an attack on the enemy battle cruisers at Brest, he made twelve runs over the target before releasing his bombs. On a later occasion, when over Kiel, he was twice forced down to almost ground level by anti-aircraft fire, but, in spite of damage to his aircraft, he came back each time, eventually releasing his bombs over the target. His gallantry and devotion to duty have been outstanding.

BAR TO THE DISTINGUISHED FLYING CROSS.

Act. Flt. Lt. L. W. COLEMAN, D.F.C., R.A.F.V.R., No. 148 Squadron.—One night in May, 1941, this officer was the captain of an aircraft which carried out an attack on the aerodrome at Benina. He displayed great skill and tenacity in locating his target, and carried out his attack with great determination, bombing and machine-gunning the aerodrome from different heights, sometimes from less than 1,000 feet. He destroyed at least two Junkers 52s on the ground and damaged others. Just after he had returned from this attack an incoming aircraft crashed and caught fire. Though the petrol tanks and bombs on the crashed aircraft were exploding, Flt. Lt. Coleman ran to another aircraft standing nearby, started the engine, and taxied it away to safety. He has continuously displayed outstanding courage and devotion to duty.

DISTINGUISHED FLYING CROSS.

Sqn. Ldr. L. W. HOWARD, No. 77 Squadron.—This officer has commanded an operational flight since July, 1940. During this period he has taken part in numerous attacks on important targets in Germany, and also on the enemy-occupied port of Bordeaux. He has at all times displayed a fine spirit in the execution of these flights, and has set and maintained a high standard of operational efficiency throughout his command.

Act. Sqn. Ldr. R. ANDERSON, R.A.F.O., No. 83 Squadron.—This officer has participated in many operational flights over enemy and enemy-occupied territory, often in the face of intense and sustained anti-aircraft fire. In all these operations he has shown the greatest determination in pressing home his attacks, and, by his consistent zeal and efficiency, has set a splendid example to all.

Act. Sqn. Ldr. K. P. SMALES, No 44 Squadron.—This officer has participated in many attacks on enemy dockyards in France and Germany, and also on important oil and railway depots. One night in February, on returning from a raid over Dusseldorf, he was attacked by an enemy fighter when over his base aerodrome. Although the port engine of his aircraft was put out of action by the enemy's fire, he displayed great skill in evading the attacker and landed safely without the help of landing lights. He has been a successful and resourceful pilot, and has pressed home his attacks with great determination.

Act. Sqn. Ldr. A. H. SMYTHE, A.F.C., No. 214 Squadron.—This officer has commanded a flight for the last five months. He has completed numerous operational flights against the enemy in the execution of which he has displayed splendid leadership and great determination in his efforts to bomb his targets accurately. On one occasion, at Bremen, being unable to locate his allotted target owing to haze, he flew to Wilhelmshaven, where he dropped his bombs on a warehouse, starting two big fires. He has set a splendid example.

Act. Flt. Lt. R. E. TALLIS, R.A.F.V.R., No. 82 Squadron (since reported missing).—In April, 1941, this officer was detailed to seek and attack enemy shipping off the Norwegian coast. Flying among the Norwegian islands, he observed a newly built runway on a small island and five Messerschmitts on the ground with their engines running; two others were flying round the aerodrome.

Despite considerable anti-aircraft fire and the presence of the two fighters, Flt. Lt. Tallis carried out a daring attack from a very low height. One of his bombs burst in the centre of the runway, and another exploded beneath one of the enemy fighters as it was taking off, completely destroying it. The aircraft on the ground were also machine-gunned. After the attack, in company with another of our aircraft, he was engaged in resisting the attacks of three enemy fighters for about sixteen minutes. He has carried out numerous operational flights, and has at all times displayed great courage and a keen determination to reach his objective under any condition.

Act. F/O. R. W. FASTNEDGE, R.A.F.V.R., No. 139 Squadron.—This officer was the observer in an aircraft which was one of a formation detailed to attack special targets at Den Helder. In the face of intense anti-aircraft fire, he bombed his specific target from a height of only 50 feet, scoring a direct hit. Immediately afterwards he was wounded in the leg, and, at the same time, his pilot was also hit.

The aircraft began to fly erratically, and F/O. Fastnedge thereby realised that his pilot must be badly wounded. Although the aircraft was still flying at only 50 feet and within the target area, the pilot was removed from his seat with the aid of the air gunner, and F/O. Fastnedge took over the controls and flew the aircraft back to base.

On arrival over the aerodrome, the pilot was assisted back into his seat in order that he might land the aircraft, but, owing to his dazed condition, he was unable to see sufficiently. F/O. Fastnedge guided him in, and between them they made a successful landing. The courage, initiative and ability of this officer, under extremely difficult circumstances, were of the highest order.

Act. Flt. Lt. G. E. GOODE, R.A.F.V.R., No. 105 Squadron.

TOUGH SUBJECTS: The King talking to paratroops at a recent demonstration.

P/O. J. F. HOGAN, No. 105 Squadron.

In May, 1941, Flt. Lt. Goode, P/O. Hogan and Sgt. Rowland were the pilot, navigator and wireless operator-air gunner respectively of an aircraft which, despite the absence of cloud cover, attacked the oil-storage tanks to the west of Rotterdam.

In the face of intense anti-aircraft fire, Flt. Lt. Goode descended to a low level, releasing his bombs over the objective. During this attack P/O. Hogan was severely wounded by a shell which burst on the front of the aircraft.

Flt. Lt. Goode had altered course for home when he was attacked in turn by each of five pursuing enemy aircraft. P/O. Hogan, who had retained consciousness, rendered valuable assistance by giving clear instructions to his pilot, who was thus able to adopt skilful evading tactics.

Sgt. Rowland was wounded in the trigger finger and his starboard gun put out of action. Nevertheless, he continued firing with the remaining gun, worked the turret by hand, as the mechanical control was damaged.

The attackers eventually broke away, and Flt. Lt. Goode, although wounded in the hand, flew his damaged aircraft back to this country, where he made a successful forced landing. Throughout the operation Flt. Lt. Goode, P/O. Hogan and Sgt. Rowland displayed the greatest courage, fortitude and devotion to duty.

DISTINGUISHED FLYING MEDAL.

Sgt. Geoffrey Serpell ROWLAND, No. 105 Squadron.—For citation see Flt. Lt. Goode and P/O. Hogan, above.

London Gazette

Royal Air Force

Air Ministry,
May 23rd, 1941.

General Duties Branch.

The follg. are granted commns. for durn. of hos. tilities as P/Os. on probn.:—W/O.: (Apr. 26) C. L. Trickett. Temp. W/O.: (May 1) L. J. Brown. Flt. Sgts.: (Apr. 8) L. Ward; (Apr. 24) J. F. Smith; (Apr. 25) G. H. Bridges; (May 1) J. A. McCudden. Sgts.: (Mar. 27) F. T. Butcher; (Apr. 3) E. R. Pierce; (Apr 24) L. C. Giles, A. J. Scott, D.F.M., W. S. Jenkins; (Apr. 26) E. T. Sellick; (Apr. 28) G. W. Utting; (May 1) F. G. Constable, D.F.M.; (May 3) E. J. Harrod.

F/O. on probn. L. S. M. Bailey, A.F.C., is confirmed in his appt. and promoted to war substve. rank of Flt. Lt. (Apr. 1).

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Apr. 1) L. Bennett, D.F.C., W. Bradshaw, A. K. Cook, D.F.C., J. N. Craigie, E. J. Cutler, C. T. Dacombe, R. C. Haine, D.F.C., N. B. Harvey, G. Rees, J. H. Searby, R. R. B. Simpson, F. H. Stubbs, D.F.M., S. C. Sutton, R. D. Westlake, J. C. Wheeler, R. W. Cox, W. C. McArthur, I. R. McDiarmid, D.F.C., J. F. Sach, D.F.C.; (Apr. 7) J. R. A. Careless, N. W. McLeod,

WITH THE TRAINEES : Mr. Winston Churchill visits an R.A.F. training establishment.

S. G. Stock, A. D. Webb, R. F. Williams; (Apr. 14) H. F. Bishop.

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(July 28, 1940) A. G. Duguid; (Dec. 21, 1940) I. N. Bonard; (Mar. 12) A. C. Dier; (Mar. 23) G. O. M. Wright; (Mar. 24) A. J. A. Llewellin; (Mar. 27) P. N. Brinsden; (Apr. 7, Sen. Jan. 10) B. Everton-Jones; (Apr. 12) E. T. Cooper, R. M. Coste, E. F. P. Wheller; (Apr. 23) G. E. Boukl; (Apr. 25) M. Stockdale; (Apr. 27) D. M. Brass, R. F. Hatton, D. V. G. Mawhood, J. P. Redmond, W. G. Thompson, F. C. Willis; (Apr. 28) G. J. H. Chrystall.

The follg. F/Os. are granted war substve. rank of Flt. Lt.:—(Dec. 6, 1939) R. P. Wallace-Tarry; (Apr. 1) M. C. Adderley, A.F.C.

The follg. P/Os. are promoted to war substve. rank of F/O.:—(Mar. 2) C. D. Rash, D.F.C.; (Mar. 4) D. W. Peck; (Mar. 7) O. G. E. Roberts (2nd Lt., Scots Guards); (Mar. 24) J. S. Simson, D.F.C.; (Apr. 2) I. R. Krohn; (Apr. 6) P. O. D. Allcock, G. R. Bennette, W. J. O. Coleman, H. G. Holmes, P. A. C. Jackson, A. J. Ogilvie; (Apr. 7) J. C. Cairns, D.F.C., J. K. Rodger; (Apr. 9) A. G. McIntyre, W. Raymond; (Apr. 10) A. C. Cochrane; (Apr. 11) T. E. O. de la P. Beresford (2nd Lt., R.A. (T.A.)), O. D. B. Coe (2nd Lt., Cheshire R. (T.A.)), J. N. W. Kerr (Lt., R. Tank R.), E. D. L. Lee (2nd Lt., R.A. (T.A)), J. P. Lucas (2nd Lt., The Buffs), R. L. Macgregor (2nd Lt. R. North Fus.) G. E. Robertson (2nd Lt., R. North. Fus.), W. L. Thomas (2nd Lt., Manch. R.); (Apr. 20) J. C. Davidson, J. Dean, P. B. Gough, D. O. Hobbis, G. M. Howard-Jones, A. E. Rimmer, E. N. Southwell, J. Kee; (Apr 27) D. P. Clark, D. Y. Douglas, E. A. Snow, (Apr. 27) J. J. Fisher T. D. I. Robison; (May 21) J. A. Milne.

The follg. P/Os. are granted war substve. rank of F/O.:—(Apr. 1) J. S. Robinson, J. N. S Cumming; (Apr. 16) L. E. Speer, A.F.C.

The follg. are transfd. to Technical Branch:—Wing Cdrs.: (Apr. 24, 1940) L. de V. Chipman, F. S. Mitchell, W. Wynter-Morgan, R. J. P. Morris, J. R. Mutch, C. F. Sealy, Sqn Ldrs.: E. M. T. Howell, D. N. J. P. Leggett, R. C. Richmond, G. P. Woodhouse, D. B. Hatfield P/O. on probn.: (Feb 2) W P. Olesen (since promoted).

F/O. R. W. Ayres, D.F.C., takes rank and precedence as if his appt. as F/O. bore date Feb 6. Reduction to take effect from Apr. 6.

Technical Branch.

The follg. are granted comms. for durn. of hostilities as F/O. on probn.:—W/O.: (May 1, Sen. Dec. 20, 1940) C. E. Rolle. As P/Os. on probn.:—W/Os.: (Apr. 22) R. J. Marks; (Apr. 26) M. G. McNama; (Apr. 29) A G. Evans. Flt. Sgts.: (Mar. 26) V. J. Royce; (Apr. 26, Sen. Dec. 17, 1940) R. C. Barrass; (May 1, Sen. Nov. 25, 1940) C. B. Shore. As Act. P/Os. on probn.:—Flt. Sgts. (Mar. 26) D. W. Munro; (May 2, Sen. Oct. 16, 1940) H. S. Moore; (May 3, Sen. Oct. 16, 1940) H. F. J. Couzens. Sgts.: (Apr 25, Sen. Dec. 20, 1940) J. E. S. Boxall; (May 2, Sen. Jan. 13) G. Medd.

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Apr. 20) W. G. Womersley; (May 19) H Stanway, H. V. Hughes, M.B.E., A.F.M.

The follg. F/Os. are granted war substve. rank of Flt. Lt.:—(Apr. 1) W. H. G. Hampshire, F. G. Mills, H Walters, M.B.E., E. J. G. Hill; (Apr. 3) R. D. Briggs; (Apr. 8) J E. Brown, A.F.M.; (Apr. 19) W. Corden.

P/O. on probn. A. B. Scott is promoted to war substve. rank of F/O. on probn. (Mar. 1).

The follg. P/Os. are granted war substve rank of F/O.:—(Apr. 1) G. D. Mills; (Apr. 7) J E. Davies.

Administrative and Special Duties Branch

The follg. are granted comms. for durn. of hostilities as P/Os. on probn.:—W/O.: (Apr. 22) M. J. Harris. Flt. Sgt.: (Apr. 26) R. Punyer. As Act. P/Os. on probn.:—Flt. Sgt.: (May 3) F. I. Pettigrew. Sgts.: (May 2) J. H. Turner; (May 3) F. Bottoms. Cpl.: (May 2) A. W. Warren.

P/O. on probn. F. W. Dowling is confirmed in his appt. and promoted to war substve. rank of F/O. (May 17).

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Mar. 14) R. W. D. Hier; (Mar. 21) A. D. Crompton, E. A. Challis.

The follg. F/Os. are granted war substve. rank of Flt. Lt.:—(Apr. 28) E. S. Bishop; (Apr. 30) R. A. Markwick.

The follg. P/Os. are granted war substve. rank of F/O.:—(Apr. 14) R. Martin; (Apr. 25) H. W. M. Stott.

The follg. P/Os. on probn. are promoted to war substve. rank of F/O. on probn.:—(Mar. 1) G. W. Jordan, W. R. Scrivener.

The follg. are transfd. to Technical Branch:—Wing Cdr.: (Apr. 24, 1940) M. H. Garnons-Williams. P/Os. on probn.: (Aug. 26, 1940) G. A. P. Duhy; (Aug. 30, 1940) W. A. H. Thomas; (Jan. 12) L. J. Hall, L. C. N. Penney, W. R. Saunders; (Jan. 23) H. M. Walker.

Equipment Branch.

The follg. are granted comms. for durn. of hostilities as P/Os. on probn.:—W/O.: (Apr. 25) R. C. Hayton. Sgt.: H. P. Webb.

Act. P/O. on probn. A. C. Straker is graded as P/O. on probn. (Dec. 6, 1940).

P/O. on probn. G. Leitch is promoted to war substve. rank of F/O. on probn. (Mar. 1).

P/O. R. E. Walkerdine is granted war substve rank of F/O. (Dec. 1, 1940).

F/O. W. H. Bowden takes rank and precedence as if his appt. as F/O. bore date Sept. 4, 1939 Reduction to take effect from Apr. 8, 1941

Accountant Branch

F/O. S. S. Caris is granted war substve. rank of Flt. Lt. (Apr. 1).

The follg. P/Os. are granted war substve. rank of F/O.:—(Apr 1) J. G. Lister; (Apr. 11) J. M Birnie.

Miscellaneous

W/O. C. L. P. Ward is granted a comm. for durn. of hostilities as F/O. on probn on appt. as Director of Music (Apr 24).

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS

General Duties Branch.

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Mar. 20) C. D. Beaumont; (Mar. 23) C. G. Clegg; (Apr. 11) F. G. Haywood; (May 15) P. E. Bressey; (May 18) B. T. Aikman, D.F.C., J. M. Foxley-Norris, M. T. Maw, C. M. Scrutton.

The follg. F/Os. are granted war. substve. rank of Flt. Lt.:—(Apr. 1) G. R Tench; (Apr. 7) R. F. Bulstrode.

Technical Branch

F/O. C. J. A. Delany relinquishes his comms on account of ill-health (May 21)

Royal Air Force Volunteer Reserve

General Duties Branch.

The follg. are granted comms. for durn. of hostilities as P/Os. on probn.:—Sgts.: (Dec. 18, 1940) E. W. Wright, D.F.M.; (Jan. 2) G. E Price, D.F.M.; (Mar. 5) S. B. L. Beattie, R. Cox, G. Gates, R. H. Harwood, B. St. J. Inglis, P. N. Kenny, G. F. Tredwell, G. E. Willis, R. H. L. Dawson, H. R. Fielding, A. J. Mottram, R. B. E Phillips, P. A. S. Rumbold; (Mar. 6) F. R. Walker-Smith; (Mar. 8) B. J. D. Hall; (Apr. 9) J. B. Freestone; (Apr. 24) J. McGregor-Cheers, J. P. Mills, G. C. C. Palliser, A. C. Baker, A. J. Winder; (Apr. 26) D. A. F. Allmond, W. F. Clayton-Graham; (Apr. 28) K. A. McFarland; (Apr. 30) J. H. Walker, D.F.M.; (May 3) W. H. Broom, J. McGill, M. O'Donovan. L.A/Cs.: (Apr. 10) J. W. Lovatt-Davies, D. L. Porter, M. G. Boggon, J. A. Esler, R. S. Wilson; (Apr. 24) W. H. T. Andrews, R. Atkinson, E. A. Bairstow, B. P. Burton, P. J. Channer, G. R. Dixon, R. H. Farrell, W. L. Griffiths, P. J. Halliday, J. D. Hancock, A. C. L. Hodge, C. A. C. Havelock, A. B. Smith, J. G. Stephenson; (Apr. 27) A. W. Bloom, E. Dickinson, L. R. Marshall, N. L. McCulloch, H. H. Moon, R. M. Oliver, T. J. Parrington, E. H. L. Shore, C. H. Stone, J. R. A. Stuart, J. C. Surman, P. R. Thomas, A. E. J. Thorne, A. Torrance, R. N. Weeks, J. N. Bowker, D. R. Fair, R. W. Lawrence, G. L. Mandeno, J. A. F. McKay, R. F. Oakes, W. J. Pershke, C. R. Sanders, J. R. Traill, C. Wilson, M. L. Davies, J. M. L. Rogers, J. R. C. H. Graves. As Act. P/Os. on probn.:—(Nov. 16, 1940) B. N. Harden, H. M. Kimberley, I. J. Shaw.

F/O. on probn S. B. Cliff is confirmed in his appt. (Apr. 10).

Act. P/O. on probn. J. O. Hedley is confirmed in his appt. and graded as P/O. (Apr. 26).

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Mar. 2) A. C. Black; (Mar. 16) E. J. Clelland; (Apr. 1) W. Anderson, A. E. Broadhurst, N. A. Buchanan, N. P. Ewart, A. S. Turnbull, D. J. Falconer; (Mar. 16) M. M. Marsh; (Mar. 17) J. Turnbull; (Apr. 7) N. H. Carrier, E. P. Howell M. H. Maggs, R. T. Hunter; (Apr. 15) A. H. B. Friendship, D.F.M.; (Apr. 16) J. O. Bostock, J. W. Renwick, R. M. Taylor, D.F.C.; (Apr. 17) R. G. Lauder; (Apr. 19) F. J. Kelsh, L. P. Light; (Apr. 21) J. L. Mitchell, D.F.C., B. M. Sayers; (Apr. 22) J. B. G. Rogers, R. J. Warner, G. D. S. Horsfall; (Apr. 27) F. Barrett; (Apr. 28) E. L. Archer, P. H. R. Bristow, H. R. Hirst, R. V. Muspratt; (Apr. 30) H. J. Ree, R. W. Tester; (May 5) F. R. Goddard.

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Nov. 29, 1940) F. J. Leslie; (Apr. 26) F. J. Pidgeon.

The follg. P/Os. are promoted to war substve. rank of Flt. Lt.:—(Feb. 18) D. R. Smith-Bingham; (Mar. 19) P. C. Hoyle; (Mar. 24) C. W. Passy; (Apr. 20) L R. Stephenson; (Apr. 27) C. M. Clementi, P. M. H. Thomas; (May 18) H A. S. Disney, P W. F Landale, H. M. Magrath, C. A. Wood.

The follg. P/Os. are granted war substve. rank of F/O.:—(Apr. 1) C. E. Hill, D.F.C.; (Apr. 7) E M. Undery; (Apr. 15) W. J. Littlejohn; (May 2) A. McDowall, D.F.M.

P/O. on probn. J. A. M. Reid is transfd. to Administrative and Special Duties Branch (Apr. 13).

Technical Branch.

The follg. are granted comms. for duration of hostilities as P/O. on probn.:—Sgt.: (Mar. 24) J. W. Elliott. As Act. P/Os. on probn.:—(Mar. 21) K. A. H. Adams, A. K. F. Clark, D. R. Forte, H. J. A. Gutridge, R. G. Hulley, J. W. Methley; (Apr. 25) D. M. Arnold, G. Baldwin, J. E. Blakeney, L. J. P. Checkemais, E. Daniels, W. R. Deacon, L. M. Evans, E. J. Glover, K. S. Goodyer, D. W. Leroux, G. R. Parker, J. M. Qualtrough, R. Robertson, G. A. Spencer, S. G. Spriggs, J Wray. Cpls.: (Apr. 25) J. R. Gibbons, R. B. Ransome. L.A/Cs.: B. L. P. Terry; (May 2, Sen. Jan. 31) S. E. G. Presbo; (May 2) S. W. Gardner. A/C.1: (Apr. 25) R. H. Scott. A/C.2: A H. Dormer; (May 3) R. N. Burrow.

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Jan. 25) G S. Richardson; (Feb. 17) T. Emmerson; (Mar. 18) P. D. McNeil; (Apr. 5) T. E. Pitkethly; (Apr. 16) H. I. Evans; (Apr. 23) D. C. Davies; (May 11) J. F. Holman.

The follg. F/Os. are granted war substve. rank of Flt. Lt.:—(Apr. 7) L W. Allen, M.C.; (Apr. 17) R. M. Hayes; (Apr. 27) W. J. P. Sloan.

P/O. on probn. H. G. Mugridge is promoted to war substve. rank of F/O. on probn. (Mar. 1).

The follg. P/Os. are granted war substve. rank of F/O.:—(Apr. 11) J. W Streeton; (Apr. 22) J C. Coombes.

Balloon Branch

P/O. F. G W. Jackson is granted war substve. rank of F/O. (Apr. 15).

F/O. R. Munro is transfd to Technical Branch (June 10, 1940).

Administrative and Special Duties Branch.

The follg. are granted comms. for duration of hostilities as P/Os. on probn.:—(Sept. 8, 1939) R. A. V. Leforgeais (substd. for notifn. of Sept. 19, 1939); (July 27, 1940) J. W. Harris (substd. for notifn. of Aug. 27, 1940); (Mar. 17) F. O. Sprinks; (Mar. 24) F. C. Daniel; (Apr. 12) J. L. Browne; (Apr. 25) G. R. K. Annington, R. B Birrell, T. S. Brayshaw, P. W. E. Brown, H. V. Bull, W. L. B. Callander, J. Carmichael, H. C. C. Carver, A. W. Cooke, J. Corbishley, E. M. O. Davidson, P. Dermond, G. G. K. Farmer, F. W. Francis, W. D. Gillies, T. W. Griffiths, H. A. Ham, J. T. Haywood, L. J. Hickman, B. de C. F. Holroyd, J. M. Hunt, W. T. Hutcheson, S. S.

SERVICE AVIATION

SERVICE AVIATION

Macleod, L. H. R. Manning, F. G. Mason, Lt. J. Matthews, R. P. C. Mellersh, E. D. Moody, R. Moore, J. B. Newton, W. L. E. Page, G. H. Pearman, A. S. R. Pratt, J. S. Pudney, W. E. Shepherd, S. D. Simpson, R. L. Stewart, J. Stubbs, B. W. Swabey, R. A. Symonds, S. W. Tidmarsh, R. J. Woollatt, W. B. Wyper; (Apr. 26) R. G. B. Chadd, A. G. F. Cheesewright, S. J. Duly, H. A. Edmonds-Seal, C. E. R. Grubb-Bell, R. S. Hills, D. J. F. Jackson; (Apr. 28) B. N. Wright, J. T. Baxter, W. O. M. Williams; (Apr. 29) J. S. B. Boatman; (May 5) J. G. McMahon. Sgts.: (Mar. 26) H. J. Seddon. As Act. P/Os. on probn.:—Flt. Sgt.: (May 2) S. R. Judd. Sgts.: W. A. A. Kinge, J. D. Warren. Cpls.: (Apr. 25) G. Lavis; (May 2) R. H. Jubb, F. H. Tofts; (May 3) R. A. Powell, H. P. Coates, D. M. R. Stewart. L.A/Cs.: (Apr. 25) E. Lloyd-Jones, F. N. Backhouse; (Apr. 26) G. D. Dodd. A/C.1: (Apr. 25) E. Skelton; (May 2) D. F. G. Hastings; (May 3) J. E. Francis. A/C2: (Mar. 28) W. C. Pollard, J. E. Rhodes; (Apr. 14) H. E. M. Kingdon; (Apr. 19) A. E. Riley; (Apr. 25) R. D. R. Probert, S. L. Shaw; (Apr. 26) F. B. Henderson, F. H. Howell; (May 2) J. W. Flann, G. E. W. Priest, A. G. Stirk, R. S. Fowler, F. R. Warren; (May 3) T. B. Leventhorpe, R. Thompson-Hill, W. Heath, J. P. Hart, N. J. F. Craig.

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Feb. 5) E. G. C. Quilter; (Feb. 16) F. A. Holmes; (Feb. 19) W. J. Warner; (Feb. 21) O. Plant; (Feb. 23) T. H. Topping; (Feb. 27) D. V. Kidman; (Feb. 28) L. H. Graham; (Mar. 7) J. W. Murdoch; (Mar. 10) R. L. Rogers; (Mar. 18) L. C. Cesek, B. F. Coopman, A. J. Salton; (Mar. 21) G. R. C. Dunhill; (Apr. 1) R. C. Green; (Apr. 3) I. C. D. Clowes; (Apr. 5) R. D. Syson; (Apr. 11) J. B. Birkhead; (Apr. 18) J. Walters; (Apr. 19) F. C. Wallis; (Apr. 22) G. S. Marshall; (Apr. 26) L. T. Channing, J. A. Swaysland; (Apr. 27) W. Gatward; (Apr. 29) A. F. H. Gee, H. A. Howell; (May 4) M. Bennett; (May 6) D. K. Wheatley, J. L. Bullard.

P/O. on probn. S. H. Bonser is confirmed in his appt. and promoted to rank of F/O. (Sept. 3, 1939).

P/O. on probn. C. Illingworth is confirmed in his appt. as from Dec. 30, 1940, and promoted to war substve. rank of F/O. (Feb. 4).

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Oct. 14, 1940) R. H. Miskin; (Mar. 14) E. Bates, W. P. Murphy, G. A. Podevin, C. Henstock, H. J. Lewis, S. A. Tomlin, F. A. Maddock, B. W. May; (Mar. 21) O. W. Rawes, E. A. Walker, H. B. Moss, M.C., J. H. Jameson, J. A. Crawford; (Mar. 26) H. C. Orr (substd. for notifn. of Mar. 14 concerning this officer which appeared under heading of Equipment Branch); (Mar. 31) A. V. Motley.

The follg. P/Os. are granted war substve. rank of F/O.:—(Feb. 25) W. M. Browne; (Mar. 28) W. T. Young; (Apr. 1) S. K. Dunford, C. R. Gaffney, N. M. McDougall, R. H. Warden, F. H. Bowden, W. W. Hammond; (Apr. 2) J. S. Olliff, G. F. E. Rapson, D.S.O.; (Apr. 3) H. H. Wright, D. B. U. Mann, J. C. Foster; (Apr. 4) W. A. Hobbins, D.S.O.; (Apr. 5) J. T. Kemp; (Apr. 6) G. P. S. Pollard; (Apr. 7) K. W. Marten; (Apr. 8) B. de L. Brock, M.C., W. R. Pearson, A. Turner, M.M., E. V. Masters; (Apr. 9) E. A. Dearman, S. L. Thomson, M. W. Cruse, C. Hill, M.C.; (Apr. 10) E. G. Gordon-Poggi, R. D. Paul; (Apr. 11) H. G. G. Joynson, L. Wood; (Apr. 12) W. N. Charnley, J. R. Millbourn; (Apr. 13) H. Mawdesley; (Apr. 14) N. K. Burton Chadwick; (Apr. 15) W. T. Eccles; (Apr. 16) F. N. Ashley, C.M.G.; (Apr. 17) J. Mayhew, C. Morris; (Apr. 18) B. C. Harrison, O. A. Oeser; (Apr. 19) R. L. Mathews; (Apr. 20) H. Davenport, S. E. Whiteley, F. H. Gale, C. Winslow-Taylor, C. J. W. Mundy; (Apr. 21) H. K. Knight, C. O. Lilly, D.S.O., A. Sutherland, S. T. Holland, N. J. T. Holland; (Apr. 22) T. B. Bates, F. H. Page, H. W. Cleland, R. N. Mills; (Apr. 23) G. W. Ball, V. Rodgers, R. F. Borneman; (Apr. 24) S. Hulme; (Apr. 25) T. G. Jefferies, F. B. Lowe, E. H. Evans, M.C., R. W. K. Nott; (Apr. 27) B. Burnard, L. W. Biggs; (Apr. 29) R. S. Wishlade; (Apr. 30) P. A. Welman, M.C., H. S. Ruttle, H. N. Roffey.

The follg. are transfd. to Technical Branch:—Flt. Lt.: (Apr. 24, 1940) J. B. P. Angell (ret.). F/Os.: R. J. Rackham; (Nov. 9, 1940) C. Ewens. F/O. on probn.: (Mar. 28, 1940) D. Smith. P/Os.: (June 29, 1940) F. Bagot (since promoted); (Aug. 19, 1940) A. Thomson (since promoted). P/Os. on probn.: (Apr. 24, 1940) J. Wilkinson; (May 24, 1940) T. M. Wood; (June 22, 1940) H. Sacre (since promoted); July 24, 1940) J. F. Elston; (Aug. 14, 1940) A. Baker; (Aug. 20, 1940) J. Tee; (Sept. 9, 1940) J. E. S. Elwell; (Oct. 2, 1940) J. F. Warren, L. R. Langmead (since promoted); (Oct. 24, 1940) J. Francombe, P. J. Gouldson; (Nov. 11, 1940) G. B. P. Trippe, G. G. Petersen; (Nov. 18, 1940) J. M. Desborough, T. S. Lofthouse; (Dec. 7, 1940) E. J. Bonner; (Dec. 18, 1940) J. A. Kemsley; (Dec. 21, 1940) L. A. Hasted-Davis, F. S. C. Simmons; (Dec. 30, 1940) B. G. G. Gilmore; (Jan. 9) R. E. Salvesen; (Jan. 11) R. Foulkes; (Jan. 12) G. Bridge; (Jan. 26) G. B. Strang; (Feb. 11) A. W. B. Stewart; (Feb. 12) H. H. Bull; (Feb. 22) H. W. Endean; (Feb. 24) F. O. Baddiley; (Mar. 2) D. J. Amos, E. F. Brooks, S. V. Colbram, J. M. P. Dowson, C. Evans, K. M. Gravill, L. L. Kenchington; (Mar. 5) A. K. Caris; (Mar. 26) F. R. Wilson; (Apr. 21) A. G. Lankester, W. S. H. Maclachlan, P. J. Marsh, F. Mellor, C. W. Milburn, J. L. Nock, A. A. Old, F. N. Pannell, J. G. Russell

P/O. on probn. J. C. H. McMillan is transfd. to Equipment Branch. (May 10.)

The follg. P/Os. on probn. relinquish their comms. on account of ill-health:—(May 10) D. D. S. Tullis; (May 21) E. A. Davis.

Errata.

In notifn. of Mar. 14 concerning P/O. W. W. E. Clarke (since promoted) *for* Nov. 1, 1940, *read* Apr. 24, 1940.

The notifn. of Mar. 21 concerning P/O. W. Cunniffe should have appeared under heading "R.A.F." and not "R.A.F.V.R."

In notifn. of May 2 concerning P/O. on probn. G. Lennie, *for* P/O. *read* F/O.

Training Branch.

The follg. are granted comms. for duration of hostilities as Act. P/Os. on probn.:—(Feb. 1) G. B. Bailey, D.F.C., H. Ball, N. Barber, S. Bartle, E. J. Bush, G. S. Bell, F. A. Bendall, C. Bevington, J. H. Brown, J. D. Browning, R. F. Bulleid, S. P. Bunn, W. R. Burgess, F. S. Caves, L. G. Clarke, G. H. Cobley, T. H. Colbert, H. W. Dibble, G. J. Dickens, W. Dono, G. E. Foskett, C. E. French, H. I. Fryer, W. Fuller, R. M. Gale, R. J. R. Giblett, S. C. Green, J. P. L. Hardwick, G. B. Hargreaves, W. Hopkins, R. Hoppitt, A. J. Howard, A. Hughes, E. W. Humphreys, S. Humphreys, A. J. J. Hutchins, C. H. Jenkins, B. Jones, F. C. King, C. H. Long, T. R. MacNaughton, P. D. Mann, C. E. Marsh, K. D. Miall, R. Michaelis, W. L. Milburn, W. S. Mills, F. Mitton, R. S. Moore, H. G. Morris, F. F. E. Mountfield, G. W. Murray, J. J. W. Nelmes, W. T. Newnum, W. E. Northover, F. T. Pamment, C. E. Reynolds, E. Rice, R. K. Robson, S. Rutherford, P. Santangelo, F. S. Shorter, R. A. Staton, H. E. Storey, W. J. R. Syng, D. B. Tillotson, R. A. Townend, A. J. Trayhurn, H. Tulloch, W. H. Tysoe, H. F. Unwin, C. G. Watts, E. Williamson, J. Winchester, A. Woodcock Roux, H. Woodhead, H. W. Woollett, L. F. Wright; (Feb. 7) M. A. Ellison; (Feb. 18) W. Taylor; (Feb. 19) A. F. Emond, S. Stubbs; (Feb. 20) W. K. Readhead; (Feb. 21) E. W. Chanter; (Feb. 22) A. E. Ecclestone; (Feb. 24) E. H. Davies, J. P. Thorp; (Feb. 26) L. W. M. Kernutt; (Feb. 27) A. B. Sheppard; (Feb. 28) A. S. Darwent, J. O. Hancock, D. Kirkpatrick, E. H. Robinson, F. Stephenson; (Mar. 1) H. G. Garratt, W. T. W. Johnson, J. M. F. V. Rawlings; (Mar. 3) D. Hanna, A. N. Willson; (Mar. 4) W. H. Crowe, H. W. Hayes, W. R. Hutchison; (Mar. 6) J. F. Gillies, H. Harden, W. Hutchings, R. J. Lark; (Mar. 7) V. M. Harper; (Mar. 8) A. W. Barnes, C. E. Frost; (Mar. 9) G. M. Saul-Brown; (Mar. 10) G. Milne; (Mar. 11) H. Powell; (Mar. 12) C. T. Price, F. J. Whitcutt; (Mar. 13) H. J. F. Edgington, I. J. Nicholas; (Mar. 14) N. S. Gaylard; (Mar. 19) A. Hill; (Mar. 20) R. H. Beams; (Mar. 21) T. Jones; Mar. 25) A. C. Townend; (Mar. 27) F. Peckitt; (Mar. 30) G. G. Clutterbuck; (Mar. 31) M. Harbron; (Apr. 5) C. W. Windle; (Apr. 10) H. R. S. Bolt, G. T. Sare; (Apr. 11) C. N. Matthews, H. W. Webb; (Apr. 16) E. S. Broome, W. M. Brownlie, F. Denning, H. B. Q. Evans, E. Everington, F. Fairbrother, S. Farrar, R. W. Fenton, F. W. Field, R. Forsyth-Cameron, O. R. Guard, W. Hill, I. W. Johnson, J. M. Leighton,; (Apr. 18) T. Longstaff, P. M. Magnair; (Apr. 19) E. A. Power, E. J. Sullivan, T. W. Tapping, N. R. J. Bradshaw, J. W. Burton, A. H. D. Dutton, A. S. Fursland, E. M. Hazel, C. E. Holmstrom, M. R. Lewis, J. Lynch, D. J. Lysaght, H. G. Mountford, G. A. Nicholls, D. J. D. Smith, E. Waterhouse; (Apr. 21) S. W. Ball, T. A. Davis, J. F. Duffin, J. A. Farnham, H. C. H. Graves, J. T. Hodgson, A. Inch, J. J. T. Inman, E. F. Pipe, R. H. Ranford, D.F.C., M.C.; (Apr. 24) A. J. Doig, J. S. Grimshaw, A. Hodgkinson, G. O. Holland, J. A. Hullah, J. Hunter, I. L. Isaac, A. R. James, J. A. Jenkinson, E. E. D. Jones, F. J. Kallender, A. Kirk, M.C., A. MacIntyre, I. F. Millar, G. H. Moore, M. S. Moxon, A. W. Mungall, G. Nicholson; (Apr. 25) J. Addison, H. J. Barber, D.F.M., A. Bardill, F. H. Barker, T. H. Bird, C. B. A. Brown, J. F. Codd, H. T. Collins, R. H. Crofts, F. P. Day, G. V. Dowson, C. M. Edmunds, W. H. Gates, S. V. Gray, J. C. Hughes, W. H. Humphreys, A. K. Jackson, P. N. Jarvis, A. P. Johnson, L. King, W. B. Lane, E. J. N. Langford, J. H. S. Lemon, R. D. Morrison, H. W. Newcombe, F. C. Raggatt; (Apr. 26) D. B. Allen, F. A. Arrowsmith, S. T. Aston, A. W. Atkinson, G. B. Barratt, F. Bassett, A. Bates, G. H. Baugh, E. Beards, J. E. Billing, R. H. Caulfield, A. F. Clarke, A. W. Claude, V. B. Coster, F. W. Cracknell, G. C. Daley, A. Daiziel, O. F. Deane, R. H. Dilworth, H. E. Downing, J. L. Garner-Hayward, T. A. George, G. F. Gibson, W. G. Grey, D.C.M., M.M., H. H. Hall, J. Hampton, J. R. Harriman, L. Hart, C. J. Hawkins, E. W. Jacob, A. Kirk, H. E. S. Lorton, H. F. D. Monk, L. L. H. Moore, W. Nadin, J. Warren; (Apr. 28) J. Allan, E. F. Allwood, W. T. Andrews, A. Arrand, C. R. J. Baggs, W. Bainbridge, E. J. Baker, J. C. Barnsley, S. D. Baxter, A. F. Bebmber, P. E. Bendix, H. Benson, J. H. Berrett, G. Bissett, C. W. Black, S. Black, T. Burbidge, W. E. Brooks, J. W. J. Brown, F. Byrne, E. E. Candlish, C. D. Chapman, D. Chisholm, P. Cleydon, F. J. Colley, V. C. F. Corby, H. Cosgrove, W. Cowdry, K. E. Darby, C. G. Davies, W. B. Dent, M.C., S. A. De Ste Croix, D.C.M., M.M., A. Divine, T. N. Dowse, H. L. Eagles, W. M. Everett, C. I. Eyre, R. J. Fifield, T. Fisher, E. L. Ford, F. W. Forzham, F. T. Fretwell, A. H. Gallimore, A. V. Giddings, M. D. Griffith, W. J. W. Grossart, A. J. Grover, R. W. Hamilton, N. H. Hart, F. Hayes, M. B. Hitchman, A. R. B. Hobbs, J. J. Hogbin, C. Hossle, E. G. Hughes, A. T. Jakeman, F. G. Lacey, E. Lea, C. Loasby, T. K. Mackay, W. A. Maguire, C. S. Marsh, F. G. Morgan, E. G. Mort, N. Parry, R. Pritchett, F. W. Roberts, H. S. Robinson, G. T. Rogers, C. Rowbotham, G. A. Saunders, A. J. Smith, J. L. Spruce, H. A. Stokes, W. R. Storey, G. H. K. Taylor, E. V. M. Vine, T. E. Ward, D. A. J. Walker, S. C. Walker, W. C. J. Walker, W. Walton, R. H. Woolerton; (May 1) J. A. Hudson; (May 2) G. M. Hapgood.

Equipment Branch

The follg. are granted comms. for durn. of hostilities as P/O. on probn.:—(May 3) W. G. C. Jacks. As Act. P/Os. on probn.:—(Apr. 25) J. G. Baker, S. H. Bowden, N. Brown, W. R. Bugby, W. S. H. Cairns, G. G. Cameron, A. A. Dibben, P. V. R. Fantini, W. A. Faulkner, J. Fenwick, M. T. Leach, A. C. Moreland, L. E. Simmonds, J. C. Thornberry, C. J. Van Den Bergh, D. L. Watts. L.A/C.: A. C. Chadwick.

P/O. on probn. J. H. Andrew is confirmed in his appt. as from Apr. 2, and promoted to war substve. rank of F/O. (May 12).

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Mar. 7) N. W. F. Codd; (Mar. 21) A. S. Whiffin, G. M. Worthington; (Apr. 4) K. D. Abercrombie, N. Ackroyd, E. C. Bell, C. E. Bignall, B. W. Buswell, D. A. C. Butlin, R. N. Button, D. H. A. Cash, J. A. Garnett, H. N. Imison, N. H. Latchford, W. H. F. Luck, L. W. Neel, R. A. T. Oldcorn, E. P. Parkes-Davis, S. Pemberton, R. C. Pickup, R. L. Pulton, A. R. Read, E. H. Taylor, S. E. Taylor, C. E. Trott, H. J. Welton, F. J. West, A. H. Wright.

The follg. P/Os. are granted war substve. rank of F/O.:—(Apr. 10) J. W. Fleming, J. W. Judge; (Apr. 20) K. R. Laing, J. Whitwell; (Apr. 28) J. L. Jennings.

Act. P/O. on probn. H. C. Orr is transfd. to Administrative and Special Duties Branch (Mar. 26).

Accountant Branch

The follg. are granted comms. for durn. of hostilities as Act. P/Os. on probn.:—(Feb. 14) F. J. Power. A/C.1: (Apr. 25) B. J. I. Curran.

Medical Branch

The follg. are granted comms. for durn. of hostilities (Apr. 22) as Flt. Lts.: J. B. Mutch, M.B., Ch.B., B. C. Nicholson, M.D., B.Chir., M.R.C.P., D.P.H., P. J. Nyhan, M.B., B.Ch. As F/Os.: A. R. Bradley, M.B., B.S., M.R.C.S., L.R.C.P., G. H. Campbell, M.B., Ch.B. K. Harrison, M.B., Ch.B., H. Jefferson, M.B., B.Ch., E. O'C. Parsons, L.M.S.S.A., A. Ponder, M.B., B.Chir., L.M.S.S.A., E. S. Reed, L.M.S.S.A., J. Simpson, M.B., B.S., P. N. Stanbury, M.R.C.S., L.R.C.P., P. Steen, M.B., B.Ch., B. A. D. Stocker, M.B., B.S., M.R.C.S., L.R.C.P., P. V. Suckling, M.B., B.S., M.R.C.S., L.R.C.P., G. W. E. Walker, B.M., B.Ch., G. B. Will, M.B., Ch.B., P. B. Willan, M.R.C.S., L.R.C.P., J. J. Williams, L.R.C.P. & S.

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Mar. 5) J. S. A. Linton, M.R.C.S., L.R.C.P.; (Mar. 19) E. R. Brown, L.M.S.S.A.; (Mar. 26) R. S. Castle, M.B., B.Ch., M.R.C.S., L.R.C.P., G. T. B. Mackinnell Childs, B.Chir., M.R.C.S., L.R.C.P. A. J. B. Phillips, M.B., B.S., G. Pollock, M.D., Ch.B., F.R.F.P.S., P. Wilson, L.R.C.P., D.O.M.S.; (Apr. 9) F. R. Buckler, M.R.C.S., L.R.C.P., J. W. Garraway, M.B., B.S., M.R.C.S., L.R.C.P., A. P. Gorrie, M.B., Ch.B., A. I. McKendrick, M.B., Ch.B., E. E. Phillipp, M.R.C.S., L.R.C.P., J. F. J. Hickey, M.B., Ch.B., E. W. Melvin, M.B., Ch.B.; (Apr. 30) W. B. James, M.B., B.Ch., B.A.O., L.D.S., D. D. Morrell, M.B., B.S., L. M. Rouillard, M.R.C.S., L.R.C.P., F.R.C.S.(E).

Dental Branch

The follg. are granted comms. for durn. of hostilities as F/Os.:—(Apr. 11) F. B. Trainin, L.D.S.; (Apr 22) E. Dunstan, L.D.S., W. O. R. Evans, L.D.S., K. W. G. Hart, L.D.S., G. A. Huntly, L.D.S., W. S. Jackson, L.D.S., A. G. Merriles, L.D.S., R. V. Mummery, L.D.S., R. W. Porter, L.D.S., J. E. Secar, L.D.S., H. A. Stanger, L.D.S.

Chaplains Branch

The follg. are granted comms. for durn. of hostilities with relative rank of Sqn. Ldr.:—(Apr. 8) Rev. A. A. Smith, M.A.; (Apr. 15) Rev. E. W. Platt, B.A., Rev. B. W. Whitlow, B.A.; (Apr. 21) Rev. H. M. Jamieson, M.A., B.D.; (Apr. 29) Rev. G. W. F. Howard, Rev. T. E. M. Ashton, B.A., Rev. E. L. Fisher, M.A.; (May 1) Rev. E. H. Wheeler, Rev. S. S. A. Lounds.

Auxiliary Air Force

Administrative and Special Duties Branch

F/O. R. M. Nisbet is transfd. to Technical Branch (Dec. 21, 1940).

Women's Auxiliary Air Force

The follg. are appointed Assist. S/Os.:—(May 9) Miss F. M. Seaward; (May 10) A/CW.2 M. Abercrombie-Smythe, Sgt. S. T. Adam, A/CW.2 E. D. Brown, Cpl. S. E. Cameron, A/CW.1 E. E. Lewis, Cpl. P. Liddell, Cpl. J. F. Muckleston, A/CW.1 J. L. C. Rayner, A/CW.2 M. I. McC. Sanders, A/CW.1 R. C. Ure.

The follg. Assist. S/Os. relinquish their appts.:—(May 3) R. A. Birchall; (May 6) E. N. Scott-Elliott.

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